Bruce

BM / Harris
WS:
NEW/Permit
Per/HS/795

STATE OF FLORIDA
# DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400



December 4, 1987

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. James R. Kolanek, Manager
Environmental Services
Harris Semiconductor
Post Office Box 883
Melbourne, Florida 32901

Dear Mr. Kolanek:

Attached is one copy of the Technical Evaluation and Preliminary Determination and proposed permit for Harris Semiconductor to install/construct and Industrial Grade Water System (IGWS) to provide water for the Deionized Water Plants in Buildings 52 and 59. The system will include a vacuum degasifier to remove hydrogen sulfide ($H_2S$) and carbon dioxide from the raw well water. The removed gases will be oxidized in flare, which will be designed and built by the John Zink Company, Model EEF-U-2 Flare Tip with manual weatherproof pilot ignition panel. The pilot and enrichment fuel will be propane.

Please submit, in writing, any comments which you wish to have considered concerning the Department's proposed action to Mr. Bill Thomas of the Bureau of Air Quality Management.

Sincerely,

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

CHF/bm

Attachments

cc: T. Sawicki, CF Dist.
C. Bach, P.E.

State of Florida
Department of Environmental Regulation
Notice of Intent

The Department of Environmental Regulation hereby gives notice of its intent to issue a permit to Harris Semiconductor to install/construct an Industrial Grade Water System (IGWS) to provide water for the Deionized Water Plants in Building 52 and 59. The system will include a vacuum degasifier to remove hydrogen sulfide ($H_2S$) and carbon dioxide from the raw well water. The removed gases will be oxidized in a flare, which will be designed and built by the John Zink Company, Model EEF-U-2 Flare Tip with manual/weatherproof pilot ignition panel. The pilot and enrichment fuel will be propane. The Department is issuing this Intent to Issue for the reasons stated in the attached Technical Evaluation and Preliminary Determination.

Persons whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative determination (hearing) in accordance with Section 120.57, Florida Statutes. The petition must conform to the requirements of Chapters 17-103 and 28-5, Florida Administrative Code, and must be filed (received) in the Department's Office of General Counsel, 2600 Blair Stone Road, Twin Towers Office Building, Tallahassee, Florida 32399-2400, within fourteen (14) days of publication of this notice. Failure to file a petition within this time period constitutes a waiver of any right such person has to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the proposed agency action. Therefore, persons who may not wish to file a petition may wish to intervene in the proceeding. A petition for intervention must be filed pursuant to Rule 28-5.207, Florida Administrative Code, at least five (5) days before the final hearing and be filed with the hearing officer if one has been assigned at the Division of Administrative Hearings, Department of Administration, 2009, Apalachee Parkway, Tallahassee, Florida 32301. If no hearing officer has been assigned, the petition is to be filed with the Department's Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Failure to petition to intervene within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, Florida Statutes.

The application is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Dept. of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dept. of Environmental Regulation
Central Florida District
3319 Maguire Blvd., Suite 232
Orlando, Florida 32803-3767

Any person may send written comments on the proposed action to Mr. Bill Thomas at the Department's Tallahassee address. All comments mailed within 14 days of the publication of this notice will be considered in the Department's final determination.

RULES OF THE ADMINISTRATIVE COMMISSION
MODEL RULES OF PROCEDURE
CHAPTER 28-5
DECISIONS DETERMINING SUBSTANTIAL INTERESTS

28-5.15 Requests for Formal and Informal Proceedings

(1) Requests for proceedings shall be made by petition to the agency involved. Each petition shall be printed, typewritten or otherwise duplicated in legible form on white paper of standard legal size. Unless printed, the impression shall be on one side of the paper only and lines shall be double spaced and indented.

(2) All petitions filed under these rules should contain:

(a) The name and address of each agency affected and each agency's file or identification number, if known;

(b) The name and address of the petitioner or petitioners;

(c) All disputed issues of material fact. If there are none, the petition must so indicate;

(d) A concise statement of the ultimate facts alleged, and the rules, regulations and constitutional provisions which entitle the petitioner to relief;

(e) A statement summarizing any informal action taken to resolve the issues, and the results of that action;

(f) A demand for the relief to which the petitioner deems himself entitled; and

(g) Such other information which the petitioner contends is material.

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

In the Matter of
Application for Permit by:

Harris Semiconductor
Palm Bay Road
Palm Bay, Florida 32901

DER File No. AC 05-138795

---

INTENT TO ISSUE

The Department of Environmental Regulation hereby gives notice of its intent to issue a permit (copy attached) to Harris Semiconductor to install/construct an Industrial Grade Water System (IGWS) to provide water for the Deionized Water Plants in Buildings 52 and 59. The system will include a vacuum degasifier to remove hydrogen sulfide ($H_2S$) and carbon dioxide from the raw well water. The removed gases will be oxidized in a flare, which will be designed and built by the John Zink Company, Model EEF-U-2 Flare Tip with manual/weatherproof pilot ignition panel. The pilot and enrichment fuel will be propane. The proposed installation/ construction will occur at the applicant's existing facility located on Palm Bay Road, in Palm Bay, Brevard County, Florida. The Department is issuing this Intent to Issue for the reasons stated in the attached Technical Evaluation and Preliminary Determination.

The applicant, Harris Semiconductor, applied on August 3, 1987, to the Department of Environmental Regulation for a construction permit.

The Department has permitting jurisdiction under Chapter 403, Florida Statutes (F.S.), and Florida Administrative Code (FAC) Rules 17-2 and 17-4. The project is not exempt from permitting procedures. The Department has determined that an air construction permit was needed for the proposed work.

Pursuant to Section 403.815, F.S., and FAC Rule 17-103.150, you (the applicant) are required to publish at your own expense the enclosed Notice of Proposed Agency Action on permit application. The notice must be published one time only in a

section of a major local newspaper of general circulation in the county in which the project is located and within thirty (30) days from receipt of this intent. Proof of publication must be provided to the Department within seven days of publication of the notice. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the permit.

The Department will issue the permit with the attached conditions unless petition for an administrative proceeding (hearing) is filed pursuant to the provisions of Section 120.57, F.S. A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, F.S. Petitions must comply with the requirement of FAC Rules 17-103.155 and 28-5.201 (copies enclosed) and be filed with (received by) the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the permit applicant must be filed within fourteen (14) days of receipt of this intent. Petitions filed by other persons must be filed within fourteen (14) days of publication of the public notice or within fourteen (14) days of receipt of this intent, whichever first occurs. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S., concerning the subject permit application. Petitions which are not filed in accordance with the above provisions will be dismissed.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

Copies furnished to:

T. Sawicki, CF [illegible] st.
C. Bach, P.E.

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF INTENT TO ISSUE and all copies were mailed before the close of business on 12-7-87.

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to §120.52(9), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Martha J Wise
Clerk

12-7-87
Date

# Technical Evaluation
# and
# Preliminary Determination

Harris Corporation
Semiconductor Sector
Brevard County
Melbourne, Florida

Permit Number:
AC 05-138795

Florida Department of Environmental Regulation
Bureau of Air Quality Management
Central Air Permitting

December 7, 1987

I. Project Description

A. Applicant

Harris Corporation
Semiconductor Sector
Post Office Box 883
Melbourne, Florida 32901

B. Project Description and Location

The applicant proposes to install/construct an Industrial Grade Water System (IGWS) to provide water for the Deionized Water Plants in Buildings 52 and 59. The system will include a vacuum degasifier to remove hydrogen sulfide ($H_2S$) and carbon dioxide from the raw well water. The removed gases will be oxidized in a flare, which will be designed and built by the John Zink Company, Model EEF-U-2 Flare Tip with manual/weatherproof pilot ignition panel. The pilot and enrichment fuel will be propane.

The proposed installation/construction will occur at the applicant's existing facility located on Palm Bay Road in Palm Bay City, Brevard County, Florida. The UTM coordinates are Zone 17, 538.7 km East and 3100.9 km North.

The Standard Industrial Code is 3674, Semiconductors.

The Standard Classification Codes are:

- Miscellaneous Manufacturing Industries Major Group 39; Flares - Natural Gas: 3-99-900-23 ($10^6$ cubic feet burned)

C. Controls

Due to the foul smelling of $H_2S$ extracted with the IGWS, the control measure is to capture, transport, and oxidize the gas in a flare. The resultant pollutant emissions will be sulfur dioxide ($SO_2$).

II. Rule Applicability

The applicant's intent is subject to preconstruction review pursuant to Florida Administrative Code (FAC) Rules 17-2 and 17-4, in accordance with Section 403, Florida Statutes.

The application package was deemed complete on October 23, 1987.

The proposed project and existing facility is located in an area designated attainment for all pollutants. Therefore, review of the potential pollutant emissions shall be in accordance with FAC Rule 17-2.500, Prevention of Significant Deterioration (PSD).

Based on the 1984 emissions inventory and subsequent modifications, the estimated facility's VOC and organic solvent emissions are greater than 100 tons per year (TPY), but less than 250 TPY. Therefore, the facility is a major facility in accordance with FAC Rule 17-2.100(111). The facility does not belong to any of the major facility categories listed in FAC Rule 17-2, Table 500-1.

The following Table 1 will exhibit the projected potential pollutant emissions for the proposed project:

Table 1

| Source | Potential Pollutant Emissions | |
|---|---|---|
| | $H_2S$ | $SO_2$ |
| Flare System | 0.22 TPY | 27.61 TPY |

Note: Based on 98.5% efficiency of the flare to oxidize $H_2S$ to $SO_2$

Based on the table, the proposed increase in potential $H_2S$ and $SO_2$ emissions would be a minor modification to a major facility and exempt from new source review requirements pursuant to FAC Rule 17-2.500, PSD, and is the first permitting activity of these specific pollutants at this facility. Therefore, the potential pollutant emissions will be reviewed in accordance with FAC Rule 17-2.520, Sources Not Subject to PSD or Nonattainment Requirements.

Since there is no specific emission limiting standard contained in FAC Rule 17-2.600 nor is there any standards of performance for new stationary sources contained in FAC Rule 17-2.660 for the proposed project, the modification will be permitted in accordance with FAC Rules 17-2.250, Excess Emissions, and 17-2.620, General Pollutant Emission Limiting Standards. Also, the source will be subject to the conditions of 40 CFR 60.18(c) thru (f), General Control Device Requirements.

FAC Rule 17-2.620(2) states that no person shall cause, suffer, allow or permit the discharge of air pollutants which cause or contribute to an objectionable odor. Objectionable odor is defined as any odor present in the outdoor atmosphere, which by itself or in combination with other odors, is or may be harmful or injurious to human health or welfare, which unreasonably interferes with the comfortable use and enjoyment of

life or property, or which creates a nuisance according to FAC Rule 17-2.100(131).

In accordance with FAC Rule 17-2.250(4), sources are to be properly operated and maintained so that excess emissions are minimized. FAC Rule 17-2.250(6), requires that the Department be notified in the case of excess emissions, and the Department, in this case, is the DER's Central Florida District office.

Pursuant to 40 CFR 60.18, the flare will be subject to no visible emissions (5% opacity), except for a total period of 5 minutes during any 2 consecutive hours. Compliance tests shall be performed using EPA Methods 2, 2A, 2C or 2D, as appropriate, 15 and 22, pursuant to FAC Rule 17-2.700 and 40 CFR 60, Appendix A.

III. Summary of Emissions

A. Emission Limitations

The regulated pollutant emissions from this modification are visible emissions, which is "no visible emissions (5% opacity), except for periods not to exceed a total of 5 minutes during any 2 consecutive hours".

Table 2 reflects the projected maximum potential pollutant emissions from the proposed modification for the purpose of tracking for PSD Rule applicability pursuant to FAC Rule 17-2.500.

Table 2

| Source | Maximum Potential Pollutant Emissions | |
|---|---|---|
| | $H_2S$ | $SO_2$ |
| Flare System | 0.06 lbs/hr (0.22 TPY) | 7.06 lbs/hr (27.61 TPY) |

*Based on 8760 hours per year operations.

The permitted emissions are in compliance with all requirements of Chapter 17-2, FAC.

B. Air Quality Impacts

From a technical review of the application and supplementary material, an air quality analysis is not required.

IV. Conclusion

The emission limitations to be imposed have been determined to be in compliance with all applicable requirements of Chapter

17-2, FAC. The permitted allowable emissions should not cause any violations of Florida's ambient air quality standards.

The General and Specific Conditions listed in the proposed permit will assure compliance with all applicable air pollution regulations..

STATE OF FLORIDA

# DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

PERMITTEE:
Harris Semiconductor
P. O. Box 883
Melbourne, Florida 32901

Permit Number: AC 05-138795
Expiration Date: January 31, 1989
County: Brevard
Latitude/Longitude: 28° 01' 20"N/
80° 36' 10" W
Project: Industrial Grade Water System with Vacuum Degasifier and Flare System

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction/installation of a 600 gallon per minute Industrial Grade water system with a vacuum degasifier and flare system. The vacuum degasifier will remove hydrogen sulfide and carbon dioxide from raw well water and the removed gases will be transported to and oxidized/combusted by the flare system. The nonassisted type flare will be designed and built by the John Zink Company, which includes a self-supported flare stack, a Model EEF-U-2 flare tip (John Zink Co.), and a manual weatherproof pilot ignition panel. The construction/installation will occur at the permittee's existing facility located on Palm Bay Road, City of Palm Bay, Florida. The UTM coordinates are Zone 17, 538.7 km East and 3100.9 km North.

The source shall be in accordance with the permit application, plans, documents, amendments and drawings, except as otherwise noted in the Specific Conditions.

Attachments to be Incorporated:

1. Application to Construct Air Pollution Source, DER Form 17-1.202(1), and Mr. James R. Kolanek's cover letter dated August 28, 1987, and received August 31, 1987.
2. Mr. C. H. Fancy's letter dated September 25, 1987.
3. Mr. J. R. Kolanek's letter with enclosures dated October 16, 1987, and received October 23, 1987.
4. Copy of 40 CFR 60.18, as revised July 1, 1986.
5. Technical Evaluation and Preliminary Determination dated December 4, 1987.

PERMITTEE:
Harris Semiconductor

Permit Number: AC 05-138795
Expiration Date: January 31, 1989

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Nor does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit does not constitute a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express state opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, plant or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

GENERAL CONDITIONS:

6. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law, access to the premises, at reasonable times, where the permitted activity is located or conducted for the purpose of:

a. Having access to and copying any records that must be kept under the conditions of the permit;

b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit; and

c. Sampling or monitoring any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately notify and provide the Department with the following information:

a. a description of and cause of non-compliance; and

b. the period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

GENERAL CONDITIONS:

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source, which are submitted to the Department, may be used by the department as evidence in any enforcement case arising under the Florida Statutes or Department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes.

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon department approval in accordance with Florida Administrative Code Rules 17-4.12 and 17-30.30, as applicable. The permittee shall be liable for any noncompliance of the permitted activity until the transfer is approved by the Department.

12. This permit is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

13. This permit also constitutes:

( ) Determination of Best Available Control Technology (BACT)
( ) Determination of Prevention of Significant Deterioration (PSD)
( ) Compliance with New Source Performance Standards

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans required under Department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the Department, during the course of any unresolved enforcement action.

GENERAL CONDITIONS:

b. The permittee shall retain at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be at least three years from the date of the sample, measurement, report or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the date(s) analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. Annual hours of operation are 8760.

2. The maximum potential sulfur dioxide ($SO_2$) emissions are 7.0 pounds per hour and 30.7 tons per year.

3. The maximum potential hydrogen sulfide ($H_2S$) emissions are 493 pounds per year, which is based on a flare efficiency of 98.5%.

PERMITTEE:
Harris Semiconductor

Permit Number: AC 05-138795
Expiration Date: January 31, 1989

SPECIFIC CONDITIONS:

4. The permittee shall comply with the conditions of 40 CFR 60.18(c) thru (f).

5. No visible emissions (5% opacity) shall be allowed, except for a total period of 5 minutes during any consecutive 2 hours, pursuant to 40 CFR 60.18(c). Compliance shall be demonstrated annually using EPA Method 22 pursuant to 40 CFR 60.18(f)(1).

6. EPA Method 15 shall be performed annually to determine the maximum concentration of the $H_2S$ prior to being flared and the result should be in terms of dry standard conditions (14.7 psia and $68^0$ F). A retest shall be required if the concentration of $H_2S$ is to be increased.

7. The exit velocity of the flare shall be determined using the procedure in 40 CFR 60.18(f)(4) and either EPA Method 2, 2A, 2C or 2D, as appropriate.

8. EPA Methods shall be as described in 40 CFR 60, Appendix A.

9. The Central Florida District shall be notified in writing 15 days in advance of any compliance testing and the test reports shall be submitted within 45 days after the last test run.

10. Objectionable odors shall not be allowed off plant property pursuant to FAC Rule 17-2.620(2).

11. The construction shall reasonably conform to the plans and schedule submitted in the application. If the permittee is unable to complete construction on schedule, he must notify the Department in writing 60 days prior to the expiration date of the construction permit and submit a new schedule and request for an extension of the construction permit. (FAC Rule 17-4.09)

To obtain a permit to operate, the permittee must demonstrate compliance with the conditions of the construction permit and submit a complete application for an operating permit, including the application fee, along with compliance test results and Certificate of Completion, to the Department's District office 90 days prior to the expiration date of the construction permit. The permittee may continue to operate in compliance with all terms of the construction permit until its expiration date. Operation beyond the construction permit expiration date requires a valid permit to operate. (FAC Rules 17-4.22 and 17-4.23)

PERMITTEE:
Harris Semiconductor

Permit Number: AC 05-138795
Expiration Date: January 31, 1989

SPECIFIC CONDITIONS:

If the construction permit expires prior to the permittee requesting an extension or obtaining a permit to operate, then all activities at the project must cease and the permittee must apply for a new permit to construct which can take up to 90 days to process a complete application. (FAC Rule 17-4.10)

Issued this_____day of_____, 19__.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

_____
Dale Twachtmann, Secretary

ATTACHMENT 1

Subcode 05

8-28-87
Purolator Courier
Ticket # 880612765

Rec'd: 8-31-87
Pd. $100.00
Receipt: 76178
MR: 9-1-87

HARRIS

DER

AUG 31 1987

BAQM

FS-JRK-030-88

August 28, 1987
Subcode 05

Mr. C. H. Fancy
Deputy, Bureau Chief
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

SUBJECT: Air Permit Application - Vacuum Degasifier with Flare System - Harris Semiconductor

Dear Mr. Fancy:

Enclosed please find the original and three copies for the subject air permit application for Harris Semiconductor's facility in Palm Bay, Florida. Also enclosed is the construction permit application fee.

The subject source is a part of our Industrial Water Project. This project will utilize Floridan water as the source of industrial water which is currently being met by potable water. Potential emissions from this source are hydrogen sulfide, carbon dioxide, and sulfur dioxide. The flare is designed to control odors caused by the removal of hydrogen sulfide from the water. The projected sulfur dioxide emissions are 27.61 tons/year. This is less than the amount considered a significant emission rate as specified by 17-2.500(2)(e)2.

If you should have any questions, please feel free to contact me at (305) 724-7467.

Sincerely,

James R. Kolanek

James R. Kolanek, Manager
Environmental Services

/pgc

enclosures

cc: FDER - Orlando

STATE OF FLORIDA

Rec'd 8-21-87
Pd. $100.00

# DEPARTMENT OF ENVIRONMENTAL REGULATION

DER

AUG 31 1987

BAQM

WIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

## APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Stationary [X] New[1] [ ] Existing[1]

APPLICATION TYPE: [X] Construction [ ] Operation [ ] Modification

COMPANY NAME: Harris Semiconductor COUNTY: Brevard

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) Vacuum Degasifier with Flare System

SOURCE LOCATION: Street Palm Bay Road City Palm Bay

UTM: East 17-538700 North 17-3100900

Latitude 28 ° 1' 20 "N Longitude 80 ° 36' 10 "W

APPLICANT NAME AND TITLE: N. A. Baldisserotto Environmental Engineer, Environ. Science

APPLICANT ADDRESS: P.O. Box 883 Melbourne, FL 32901

### SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Harris Semiconductor

I certify that the statements made in this application for a construction permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: James R. Kolanek

James R. Kolanek Manager, Environmental Services
Name and Title (Please Type)

Date: 8-24-87 Telephone No. 305-724-7467

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

[1] See Florida Administrative Code Rule 17-2.100(57) and (104)

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed Chester C Bach

Chet Bach
Name (Please Type)

Harris Semiconductor
Company Name (Please Type)

P.O. Box 883, Melbourne, FL 32901
Mailing Address (Please Type)

Chester C Bach 8/25/87

Florida Regiatration No. 19110 Date: 8/25/87 Telephone No. 305-724-7324

**SECTION II: GENERAL PROJECT INFORMATION**

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

Semiconductor will be utilizing an Industrial Grade Water System to provide water for the DeionizedWater Plants in Buildings 52 and 59. The system includes a vacuum degasifier to remove $H_2S$ and $CO_2$ from the Raw Well water. The removed gases will be flared to oxidize the products and control $H_2S$ emissions. (See Attachment A)

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction 12/87 Completion of Construction 1/89

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

One (1) self-supported Flare Stack; One (1) Model EEF-U-2 flare tip; One (1) manual weatherproof pilot ignition panel: $6,000.00

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

None

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ;

if power plant, hrs/yr_____; if seasonal, describe:_____

F. If this is a new source or major modification, answer the following questions. (Yes or No)

1. Is this source in a non-attainment area for a particular pollutant? No

   a. If yes, has "offset" been applied? _____

   b. If yes, has "Lowest Achievable Emission Rate" been applied? _____

   c. If yes, list non-attainment pollutants. _____

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. No

3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. No

4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? No

5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? No

H. Do "Reasonably Available Control Technology" (RACT) requirements apply to this source? No

   a. If yes, for what pollutants?_____

   b. If yee, in addition to the information required in this form, any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

## SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable:

| Description | Contaminants | | Utilization Rate - lbs/hr | Relate to Flow Diagram |
|---|---|---|---|---|
| | Type | % Wt | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lbs/hr): 1200 lb/hr of $CO_2$; 90 lb/hr of $H_2S$

2. Product Weight (lbs/hr): _____

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

| Name of Contaminant | Emission[1] | | Allowed[2] Emission Rate per Rule 17-2 | Allowable[3] Emission lbs/hr | Potential[4] Emission | | Relate to Flow Diagram |
|---|---|---|---|---|---|---|---|
| | Maximum lbs/hr | Actual T/yr | | | lbs/yr | T/yr | |
| $SO_2$ | 7.059 | 27.61 | Model No. | | 61836.84 | 27.61 | |
| | | | | | | | |
| $H_2S$ | 0.05625 | 0.220 | | | 32,850 | 14.67 | |
| $CO_2$ | 0.75 | 2.933 | | | 438,000 | 195.54 | |
| | | | | | | | |

[1]See Section V, Item 2.

[2]Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3]Calculated from operating rate and applicable standard.

[4]Emission, if source operated without control (See Section V, Item 3).

J. Control Devices: (See Section V, Item 4)

| Name and Type (Model & Serial No.) | Contaminant | Efficiency | Range of Particles Size Collected (in microns) (If applicable) | Basis for Efficiency (Section V Item 5) |
|---|---|---|---|---|
| Self-supported flare Stack (John Zink Co.) | $H_2S$ | 98.5% | N/A | See Attachment B |
| w/Model EEF-U-2 Flare tip (John Zink Co.) | $CO_2$ | 98.5% | N/A | " |
| and Manual/Weatherproof pilot ignition panel | | | | |
| | | | | |
| | | | | |
| | | | | |

E. Fuels

| Type (Be Specific) | Consumption* avg/hr | Consumption* max./hr | Maximum Heat Input (MMBTU/hr) |
|---|---|---|---|
| propane (pilot) | 43 SCFH | | 108624.32 BTU/hr |
| propane (enrichment) | 21.37 SCFH | | 53977.5 BTU/hr |
| | | | |
| | | | |

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

Fuel Analysis:

Percent Sulfur: 0 Percent Ash: 0

Density: $1.8324 \times 10^{-3}$ g/m$^3$ lbs/gal Typical Percent Nitrogen: 0

Heat Capacity: 21,591 BTU/lb to air ratio for scrubber include BTU/gal

Other Fuel Contaminants (which may cause air pollution):

F. If applicable, indicate the percent of fuel used for space heating. N/A

Annual Average Maximum

G. Indicate liquid or solid wastes generated and method of disposal.

N/A

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: 20' ft. Stack Diameter: 6" ft.

Gas Flow Rate: 7.985 ACFM 7.985 DSCFM Gas Exit Temperature: 75 °F.

Water Vapor Content: _____ % Velocity: 5.712 FPS

## SECTION IV: INCINERATOR INFORMATION

| Type of Waste | Type 0 (Plastics) | Type I (Rubbish) | Type II (Refuse) | Type III (Garbage) | Type IV (Pathological) | Type V (Liq.& Gas By-prod.) | Type VI (Solid By-prod.) |
|---|---|---|---|---|---|---|---|
| Actual lb/hr Incinerated | | | | | | | |
| Uncontrolled (lbs/hr) | | | | | | | |

Description of Waste _____

Total Weight Incinerated (lbs/hr) _____ Design Capacity (lbs/hr) _____

Approximate Number of Hours of Operation per day _____ day/wk _____ wks/yr. _____

Manufacturer _____

Date Constructed _____ Model No. _____

| | Volume $(ft)^3$ | Heat Release (BTU/hr) | Fuel | | Temperature (°F) |
|---|---|---|---|---|---|
| | | | Type | BTU/hr | |
| Primary Chamber | | | | | |
| Secondary Chamber | | | | | |

Stack Height: _____ ft. Stack Diamter: _____ Stack Temp. _____

Gas Flow Rate: _____ ACFM _____ DSCFM* Velocity: _____ FPS

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) _____

Brief description of operating characteristics of control devices: _____

_____

_____

_____

_____

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.):

_____

_____

_____

_____

NOTE: Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be included where applicable.

## SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]

2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.

3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).

4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.)

5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency).

6. An 8 1/2" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.

7. An 8 1/2" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Example: Copy of relevant portion of USGS topographic map).

8. An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.

10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

## SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

[ ] Yes [ ] No

| Contaminant | Rate or Concentration |
|---|---|
| | |
| | |
| | |
| | |

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy)

[ ] Yes [ ] No

| Contaminant | Rate or Concentration |
|---|---|
| | |
| | |
| | |
| | |

C. What emission levels do you propose as best available control technology?

| Contaminant | Rate or Concentration |
|---|---|
| | |
| | |
| | |
| | |

D. Describe the existing control and treatment technology (if any).

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

| Contaminant | Rate or Concentration |
|---|---|
| | |
| | |
| | |
| | |

10. Stack Parameters

a. Height: ft.

b. Diameter: ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if necessary).

1.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

3.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

4.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Costs:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected:

1. Control Device:

2. Efficiency:[1]

3. Capital Cost:

4. Useful Life:

5. Operating Cost:

6. Energy:[2]

7. Maintenance Cost:

8. Manufacturer:

9. Other locations where employed on similar processes:

a. (1) Company:

(2) Mailing Address:

(3) City:

(4) State:

[1] Explain method of determining efficiency.
[2] Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

| Contaminant | Rate or Concentration |
|---|---|
| | |
| | |
| | |

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

| Contaminant | Rate or Concentration |
|---|---|
| | |
| | |
| | |

(8) Process Rate:[1]

10. Reason for selection and description of systems:

[1]Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

## SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION

A. Company Monitored Data

1. _____no. sites _____ TSP _____( ) $SO^{2}$* _____ Wind spd/dir

Period of Monitoring _____/_____/_____ to _____/_____/_____
month day year month day year

Other data recorded _____

Attach all data or statistical summaries to this application.

*Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory

a. Was instrumentation EPA referenced or its equivalent? [ ] Yes [ ] No

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

1. _____ Year(s) of data from ____/____/____ to ____/____/____
month day year month day year

2. Surface data obtained from (location)_____

3. Upper air (mixing height) data obtained from (location)_____

4. Stability wind rose (STAR) data obtained from (location)_____

C. Computer Models Used

1. _____ Modified? If yes, attach description.

2. _____ Modified? If yes, attach description.

3. _____ Modified? If yes, attach description.

4. _____ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

D. Applicants Maximum Allowable Emission Data

| Pollutant | Emission Rate |
|---|---|
| TSP | _____ grams/sec |
| $SO_2$ | _____ grams/sec |

E. Emission Data Used in Modeling

Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

F. Attach all other information supportive to the PSD review.

G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.

# ATTACHMENT A

Flow diagram dwg. P-1 illustrates the Industrial Grade water system that Harris Semiconductor will be employing. The purpose of the operation is to produce industrial water for use in Buildings 52 and 59 Deionized (DI) plants. Initial design criteria is based on a 600 GPM water flow rate.

Floridian aquifer water will be drawn from two existing 1140 gpm wells and will be conveyed via a pipe rack to the facility. The system will be located between waste treatment plant and Building 58, as illustrated in Dwg. C-2.

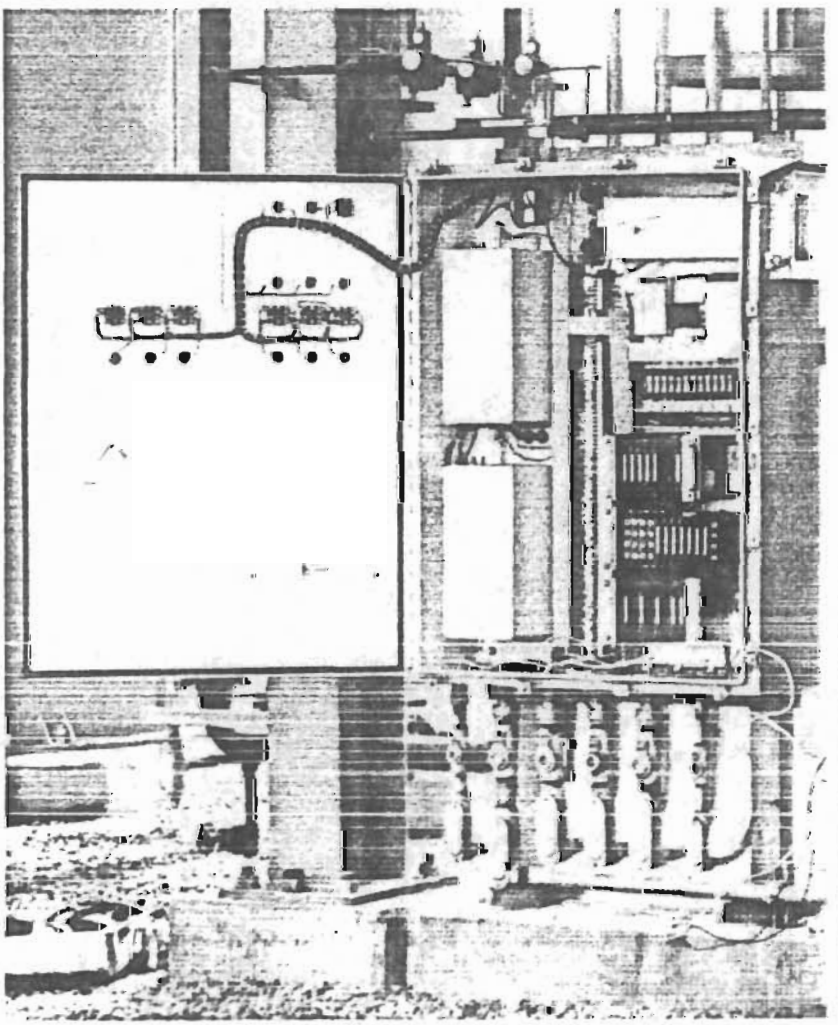
Following chemical treatment to reduce scaling and corrosive properties, the water will be filtered and pumped into the reverse osmosis (RO) membranes. A minimum of 75% of this water will pass through the membranes as purified water and will be treated in one of two vacuum degasifiers to remove hydrogen sulfide and carbon dioxide gases. The gas streams from the degasification process will be sent to a flare system to oxidize the hydrogen sulfide. The RO reject water will go to the deep well disposal system.

ATTACHMENT B

HARRIS SEMICONDUCTOR

CONTROL EQUIPMENT

# JOHN ZINK COMPANY



# FLARE SYSTEM CONTROLS

John Zink Company, the world's largest manufacturer of flare systems, offers complete flare control packages. Flare controls by John Zink ensure sole source compatibility and single point responsibility. John Zink's experience with thousands of flare systems ensures a well designed and proven control system.

## Pilot Ignition Systems

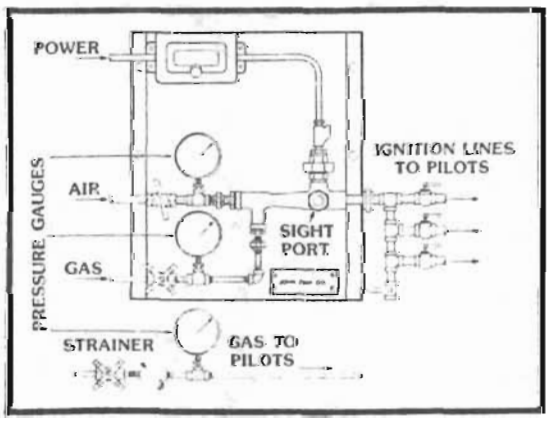
The single most important piece of control equipment in the flare system is the pilot ignition system. Safety of the entire plant depends upon proper operation of the ignition system. Each John Zink pilot ignition system offers the following features:

- All control components are easily accessible at grade
- Proven reliable ignition
- Complete shop testing prior to shipment
- All systems are designed to meet the required electrical area classifications

The following models are indicative of the variety of ignition systems available from John Zink:

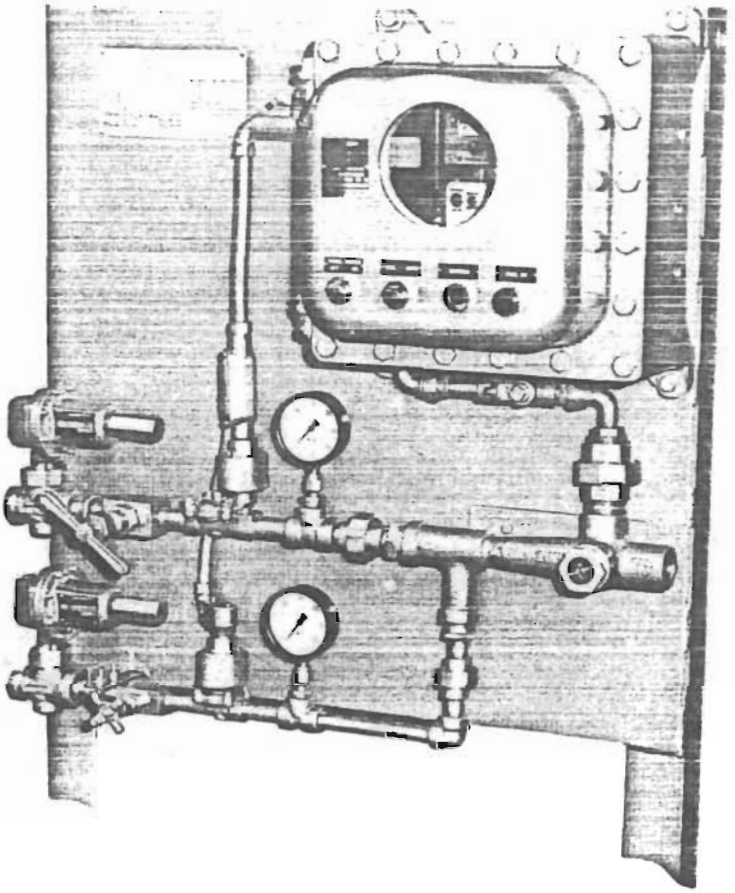
## Manual FFG (Flame Front Generator)

The industry standard for ignition of flare systems for over 30 years, the Manual FFG provides simple, reliable ignition where compressed air is available.




## Automatic FFG (Flame Front Generator)

An additional level of safety is obtained by constant monitoring of the flare pilot. In the rare event of pilot failure, automatic reignition of the flare pilot is available with this packaged ignition system. This system features solid state controls reliable monitoring and automatic reignition.



## Self Inspirating FFG (Automatic or Manual)

In the event compressed air is not available, the self inspirating ignition system utilizes fuel gas to inspirate air into a venturi mixer on the ignition line. This gas/air mixture is ignited and travels through the ignition line to light the pilot.

## Pilot Monitoring

John Zink offers PilotEye, a unique dual-waveband infrared monitor. Mounted up to 1,000 feet away, the unit monitors the flare tip and signals in case of pilot flame-out. Simple installation requires no flare shut-down. Conventional thermocouple monitors and alarm packages are also available.

## Special Ignition Systems

In areas where no electricity is available, battery powered or piezoelectric ignition systems can be provided.

In addition to ignition systems, other control systems are necessary for proper flare operation. These control systems include:

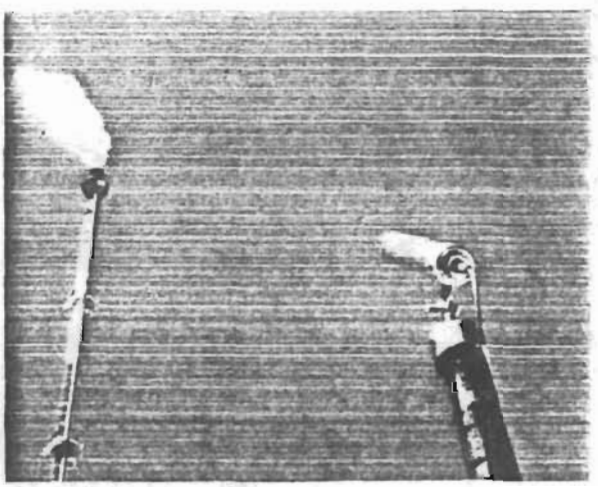
### *Purge Controls*

Purge controls for molecular seals and airrestors can be provided to ensure proper flow of purge gas to the flare system and prevent air ingression into the flare header.

In the event high temperature purge gases are vented, John Zink can provide a patented *Tempurge system.* This system monitors pressure and temperature in the flare line and injects the proper amount of additional purge gas necessary to prevent the formation of a vacuum as the waste gases cool.

### *Steam Controls*

John Zink offers a complete steam control package including steam control valves, restriction orifices, block valves, gauges and controllers all coordinated around and designed for use with the John Zink Zoom System.



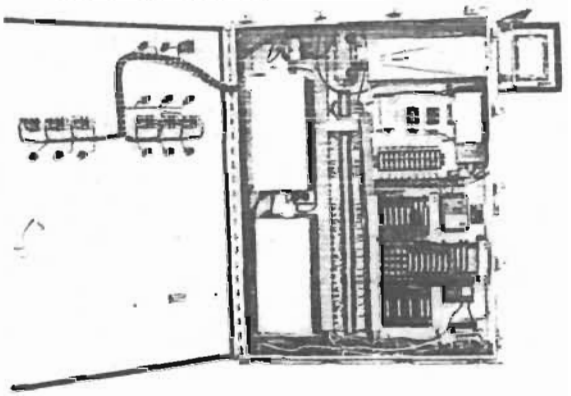
John Zink Zoom System

Details of this system are available in the John Zink Zoom System bulletin.

### *Special Flare Controls*

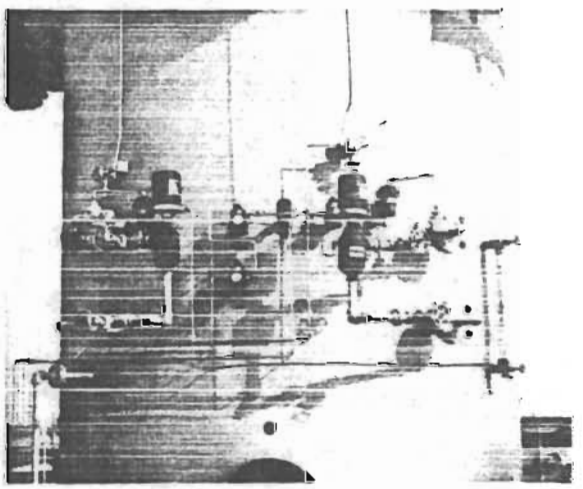
John Zink special flare controls include:

- Patented staging controls
- Knock out and liquid seal drum controls including:
  - Level controls
  - Gauge glasses
  - Condensate pumps
  - Alarms
  - Temperature controls
  - Control valves



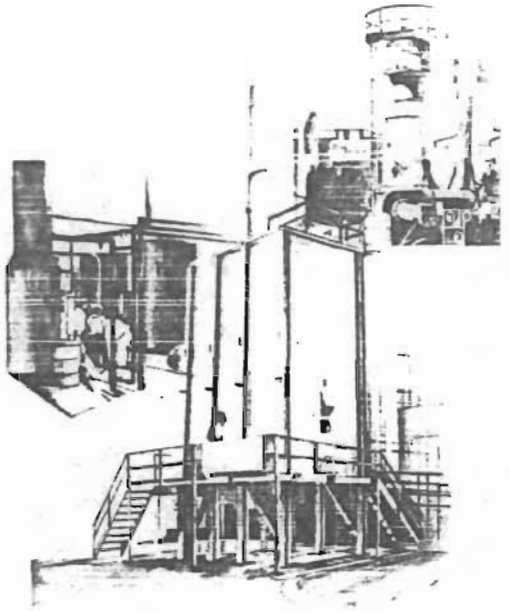
Staging Control Panel

- Blower controls for air assisted flares and other applications.



Typical Liquid Seal Knockout Drum Controls

- Explosion prevention systems for gases such as Hydrogen, Ethylene Oxide, Carbon disulfide, Acetylene and other explosive gases.
- Flame extinguishing systems
- Steam desuperheaters
- Skidded, assembled, completely prepiped control packages for flaring wastes



Rely on John Zink for:
- Flares
- Burners
- Packaged Burners
- Resource Recovery
- Incinerators
- Heat Recovery
- Heating & Air Conditioning and Associated Equipment


**JOHN ZINK COMPANY**

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Other offices are located in major cities around the world.


**World's Largest Manufacturer of Flare Systems**


Brochure 5022

## EEF Series Flares

The EEF Series Flares are the latest development in flaring technology from the John Zink Company. More than half a century of combustion expertise has been incorporated with the latest technological advances and a stringent testing program to provide you with a dependable, efficient flaring system at substantially lower operating costs.

Normally, plant wastes are supplied to the flare system through safety relief valves. With this unpredictable source of waste, the only acceptable means of ignition is a continuously burning pilot. With today's high energy costs, utilities for a continuously burning pilot represent a substantial operating expenditure. John Zink has developed the EEF series flares, which reduce pilot gas consumption by as much as 80%.

Flare burner stability is accomplished with a combination of the flare pilot and a Flame Stability Tip. John Zink has developed a state of the art Flame Stability Tip for use specifically with the lower energy pilots of the EEF Series Flares. With smaller pilot capacities, the Flame Stability Tip assumes a critical role in the overall combustion stability of the flare.

The metallurgical selection for the EEF Series Flares is based upon actual field experience and continuing research and development efforts to ensure optimum design at lower costs.

The following series of EEF flares will have an attractive pay back when considered for your next turnaround or in new plant construction. The nomograph on the back cover will help you estimate your energy savings.

### EEF-U

The EEF-U is an excellent choice in services which do not require smokeless operation or where waste gases will not smoke. Where service conditions warrant, a very high temperature refractory, secured with a special stainless steel anchoring system and reinforced with high alloy needles, is installed.

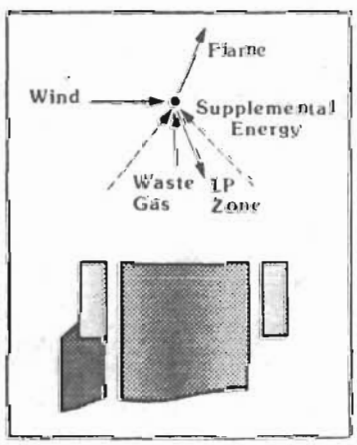
### EEF-PF

The EEF-PF flare is specifically designed for horizontal firing in a pit where two phase flow will exist. Proper installation of the PF flare and the pit design are critical to flare life. John Zink Company has the experience and the expertise to assist you with the necessary engineering to ensure proper operation.

Typical EEF-PF Installation

### EEF-LS

John Zink has developed a special EEF-LS Flare which extends flare life.



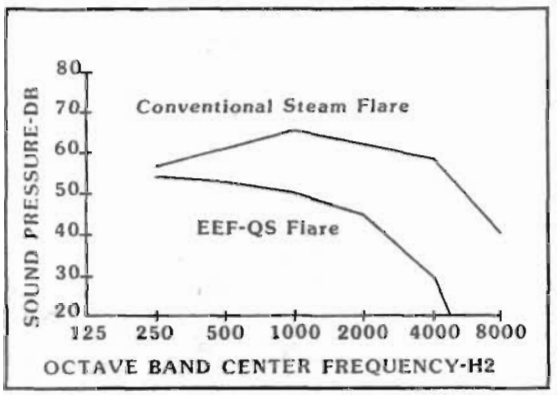

Vertical Design of EEF-LS Flare

The EEF-LS design uses energy from a secondary source to overcome wind effects and move the flame away from the flare thus eliminating wind influenced flare damage. This flare can be utilized in a horizontal or vertical position.

The EEF-LS Flare effectively increases flare service life, reduces down time and cuts maintenance and replacement costs.

## EEF-QS

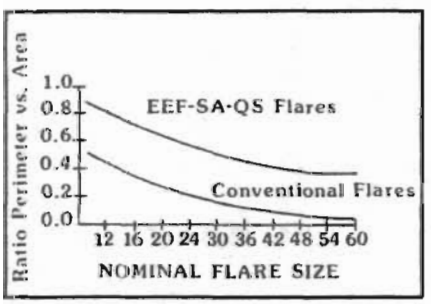
The EEF-QS Series Flares reduce noise levels up to one half that of conventional steam assisted smokeless flares. When smokeless flaring is required, the traditional solution has been steam injection. One of the most persistent problems with steam injection is the associated noise. The EEF-QS utilizes the well proven noise abatement effect of increased shear to flow area as depicted in the accompanying graph.




## EEF-SA-QS

The EEF-SA-QS offers the maximum possible steam efficiency in a single point flare with the lowest possible noise levels and the highest smokeless flow rates available. During normal operation, noise levels may be 1/8 those of conventional steam flares.

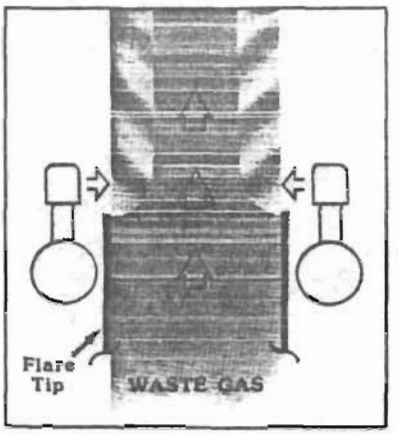
The perimeter of the flare, which is the site of air and steam injection, increases linearly with the diameter, simultaneously, the waste flow area increases as a squared function of the diameter. The net effect is a squared increase in the flow and a linear increase in the air and steam availability.

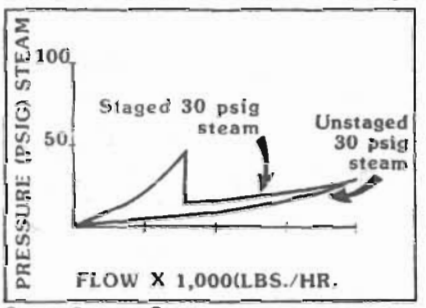



The EEF-SA-QS produces an artificial increase in the critical perimeter to area ratio by a multiplicity of steam/air injection points internally and externally.

## EEF-SS

The EEF-SS Flare is designed to utilize low cost, low pressure steam. Traditionally, the use of this low pressure steam has resulted in poor steam efficiency at turndown. This phenomenon can be demonstrated by the adjacent diagram. In order to produce smokeless operation, it is necessary to completely mix the waste gas, steam and air. Low pressure steam at turndown does not have sufficient energy, in a traditional flare, to penetrate the waste. This results in an unnecessarily high steam usage at turndown. John Zink's concept of staged steam flaring produces a higher penetration of steam and air over the entire operating range.



Steam Staging Curve

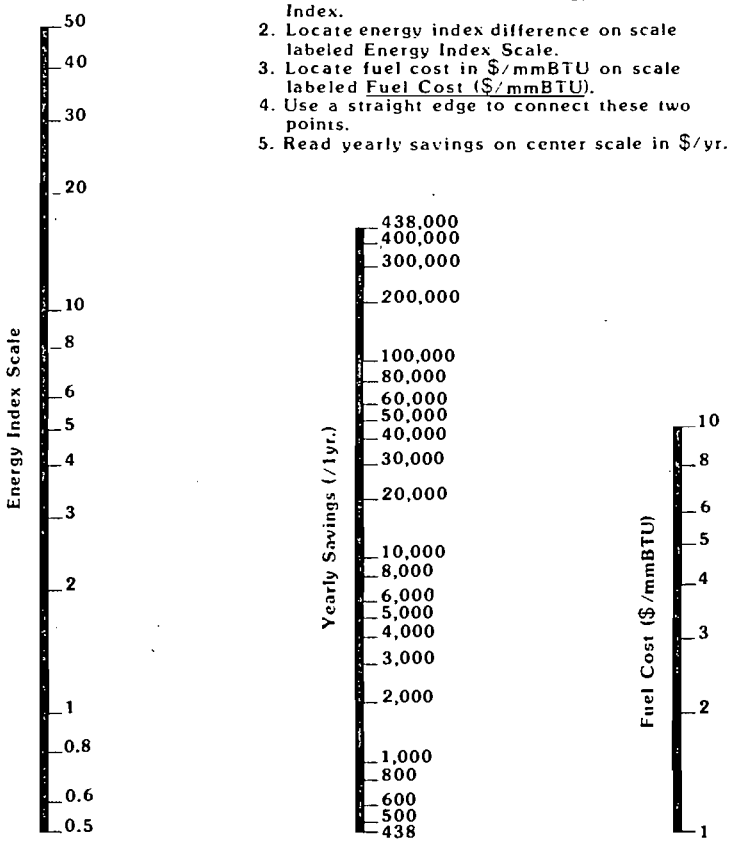
The above steam staging curve demonstrates the improvement in energy levels. Significant cost savings can be achieved through the use of low pressure steam in the EEF-SS flare.

The new series of EEF flares has many advantages for your facility including:

- Lower utility costs
- Improved efficiency
- Lower steam noise levels
- Increased flare burner life

# NOMOGRAPH SHOWING SAVINGS FOR EEF FLARE

INSTRUCTIONS FOR NOMOGRAPH:
1. Calculate difference of Energy Index.
2. Locate energy index difference on scale labeled Energy Index Scale.
3. Locate fuel cost in $/mmBTU on scale labeled Fuel Cost ($/mmBTU).
4. Use a straight edge to connect these two points.
5. Read yearly savings on center scale in $/yr.




# TABLE OF TYPICAL ENERGY INDEX OF EEF FLARES VS. IN USE FLARES

| FLARE TIP SIZE | EEF FLARE | TYPICAL EXISTING FLARE |
|---|---|---|
| 8" | 1 | 7 |
| 12" | 1 | 10.5 |
| 18" | 2 | 10.5 |
| 24" | 3 | 10.5 |
| 36" | 3 | 14 |
| 48" | 3 | 14 |
| 60" | 3 | 14 |

UTILITY STYLE FLARE BURNER

DATA SHEET

| | | | |
|---|---|---|---|
| 1. | CUSTOMER: | | REFERENCE NO.: |
| 2. | PLANT LOCATION: | | PROPOSAL NO.: |
| 3. | MODEL: EEF-U- 2 | ENGINEER: | DATE: |
| 4. | OVERALL LENGTH 10'-1" | NO. OF PILOTS 1 | |
| 5. | FIRING POSITION: VERTICAL | | TYPE OF PILOTS: EEP FUEL |
| 6. | DESIGN CONDITION | | FUEL CONSUMPTION 43 SCFH |
| 7. | FLOW RATE: MW: SP. GR. | | THERMOCOUPLE: No. Required |
| 8. | PRESS. DROP @ DESIGN: | | Type: K (Chromel-Alumel) |
| 9. | | | |

| | | |
|---|---|---|
| 10. | MATERIAL OF CONSTRUCTION | |
| 11. | SECTION | MATERIAL |
| 12. | Flame Retention Ring | 310 or equal |
| 13. | Upper Sect. FRR to 4'-0" | 304 SS |
| 14. | Lower Sect. 4'-0" to 10'-1" | C. Stl. |
| 15. | Flange | A-105 |
| 16. | Pilot(s) | 309 SS |
| 17. | | |
| 18. | WELDING PROCEDURES: AWS | |
| 19. | | |
| 20. | | |
| 21. | FINISH: High temperature aluminum on carbon steel | |
| 22. | | |

| | | | | |
|---|---|---|---|---|
| 23. | NOZZLE | NO. | SIZE IN. | TYPE |
| 24. | Inlet | N1 | 2 | ANSI 150# RF |
| 25. | Pilot | C4 | 3/4 | Plain End |
| 26. | Ignitor | C5 | 1 | Plain End |
| 27. | | | | |
| 28. | | | | |
| 29. | REMARKS | | | |
| 30. | | | | |
| 31. | | | | |
| 32. | | | | |
| 33. | | | | |
| 34. | | | | |
| 35. | | | | |
| 36. | | | | |
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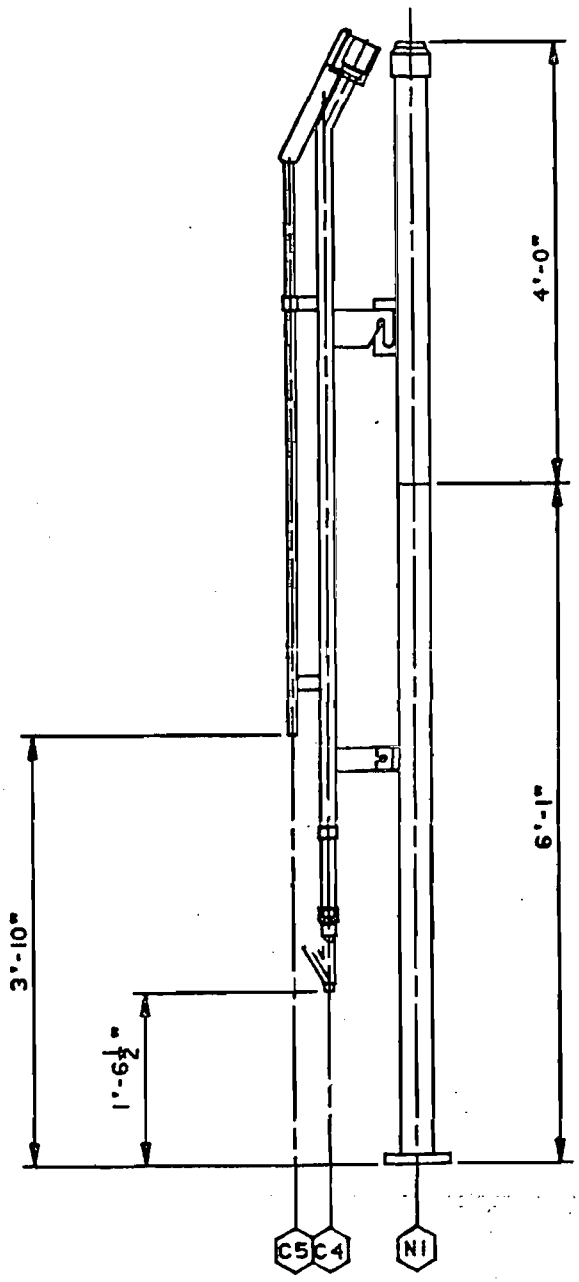
| 43. | | | | |
| 44. | | | | |
| 45. | | | | |
| 46. | | | | |
| 47. | | | | |
| 48. | | | | |
| 49. | | | | |
| 50. | | | | |
| 51. | | | | |
| 52. | | | | |



ATTACHMENT C

HARRIS SEMICONDUCTOR

MANUFACTURER TEST DATA

ATTACHMENT B.

JOHN ZINK COMPANY

ALLEGHENY INTERNATIONAL

4401 South Peoria Avenue
P.O. Box 702220
Tulsa, Oklahoma 74170
918/747-1371 Telex 497414

July 17, 1987

Harris Corporation
P. O. Box 883
Melbourne, FL 32901

Attention: Nancy Bardisserotto
Mail Stop 58-55

Reference: Flare Efficiency Study
John Zink File F609-031DL

Dear Ms. Bardisserotto:

Pursuant to your recent request, attached find a report on a flare efficiency study performed by Engineering-Science. The study was sponsored by the U.S. Environmental Protection Agency and the Chemical Manufacturers Association and took place at the John Zink International Research Center in Tulsa, Oklahoma using John Zink Flare Equipment.

You will notice on page 1-4 of the report that the combustion efficiency of the gases with a low heating value averages approximately 99.0%. We would expect the same efficiency for your application.

The attached is a condensed version of the 123 page full report which may be obtained from Chemical Manufacturers Association, 2501 M. Street N.W., Washington, D.C. 20037. If you have any questions, or require further information, please do not hesitate to contact us.

Sincerely,

JOHN ZINK COMPANY

Brian Duck

Brian Duck

A REPORT ON

A

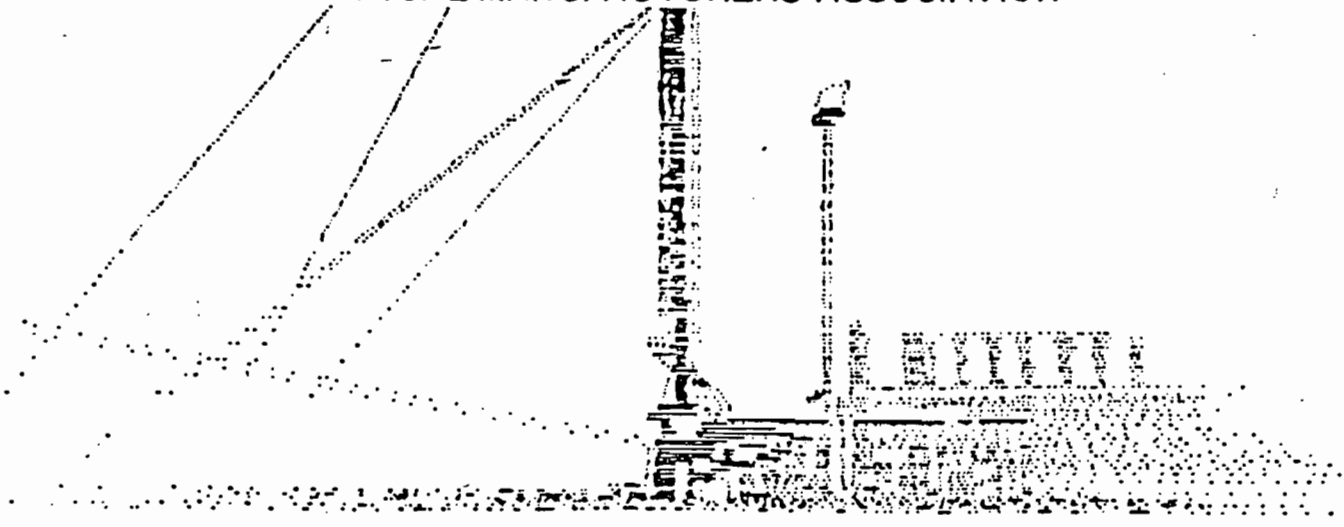
# FLARE EFFICIENCY STUDY

VOLUME I

FOR

CMA

CHEMICAL MANUFACTURERS ASSOCIATION



PREPARED BY


**ENGINEERING-SCIENCE**

DESIGN • RESEARCH • PLANNING

*3109 NORTH INTERREGIONAL AUSTIN, TEXAS 78722 • 512/477-9901*

*OFFICES IN PRINCIPAL CITIES*


ES

A REPORT ON A

# FLARE EFFICIENCY STUDY

VOLUME I

Prepared for

CHEMICAL MANUFACTURERS ASSOCIATION
Washington, D.C.

September 1982

Prepared by:

Engineering-Science
Austin, Texas

# CHAPTER 1

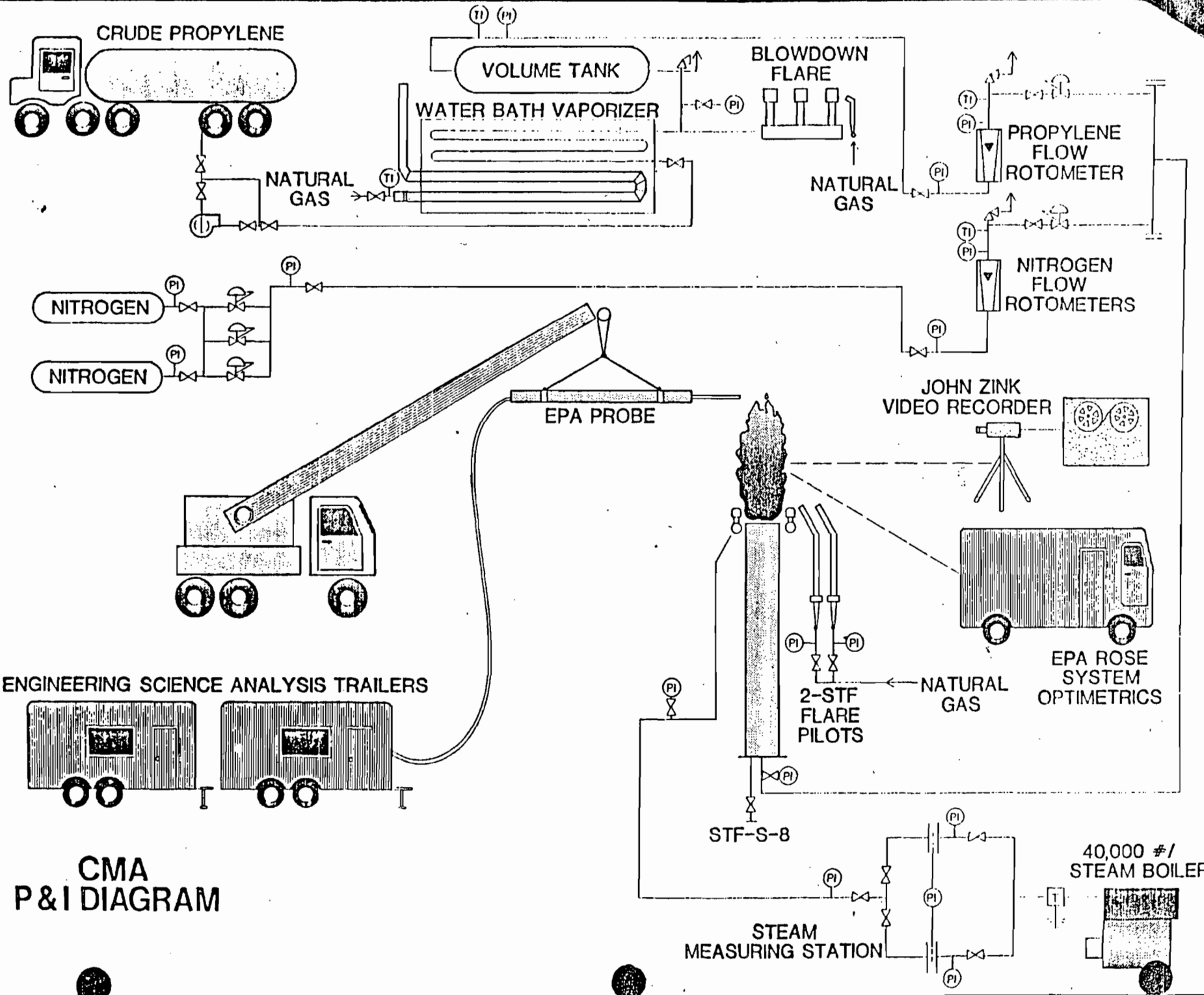
# EXECUTIVE SUMMARY

## PROJECT OVERVIEW

This document is a report on an experimental study to determine the efficiencies of flare burners as devices for the disposal of hydrocarbon emissions from refinery and petrochemical processes. The primary objectives of this study were to determine the combustion efficiency and hydrocarbon destruction efficiency for both air- and steam-assisted flares under a wide range of operating conditions. The test results indicate that flaring is generally an efficient means of hydrocarbon disposal.

Separate elements of this flare efficiency study were sponsored by the U.S. Environmental Protection Agency (EPA) and the Chemical Manufacturers Association (CMA). Other project participants included John Zink Company who provided the flares, test facility and flare operation, and Optimetrics, Inc. who operated the EPA's Remote Optical Sensing of Emissions (ROSE) system. Engineering-Science, Inc. operated the extractive flare sampling and analysis systems.

Figure 1.1 is an overview of the equipment used to operate and test the flares. The test methodology utilized during the study employed a specially constructed 27-foot sample probe suspended by a crane over the flare flame. The sample extracted by the probe was analyzed by continuous emission monitors to determine concentrations of carbon dioxide ($CO_2$), carbon monoxide (CO), total hydrocarbons (THC), sulfur dioxide ($SO_2$), oxides of nitrogen ($NO_x$) and oxygen ($O_2$). In addition, the probe tip temperature, ambient air temperature and wind speed and direction were measured. Integrated samples of the flare gas were collected for hydrocarbon specie analysis by gas chromatograph. Particulate matter samples were collected during the smoking flare tests. Sulfur was used as a tracer material in an effort to determine the dilution of the flare gas between the flare burner and the sampling probe location. However, the implementation of this untried sulfur balance method for determining dilution ratios encountered several difficulties. An alternate method of




# CMA P&I DIAGRAM

determining dilution ratios using the $CO_2$ concentration data was substituted for the sulfur balance method.

The rigorous test program included flare testing under thirty-three different operating conditions during a three-week period in June 1982. Test variables included Btu content of the flare gas (propylene diluted with nitrogen), flare gas flow rates, steam flow rates and air flow rates. The range of flare gas heating values was 80 to 2,183 Btu/scf. Steam-to-flare gas ratios varied from 0:1 to 123:1. When the flares were operated under conditions which were representative of industrial operating practices, the combustion efficiencies at the sampling probe were determined to be greater than 98%. Combustion efficiencies were observed to decline under conditions of excessive steam (steam quenching) and high flow rates of low Btu gases. Table 1.1 summarizes the results of the thirty-three flare efficiency tests.

## CONCLUSIONS AND OBSERVATIONS

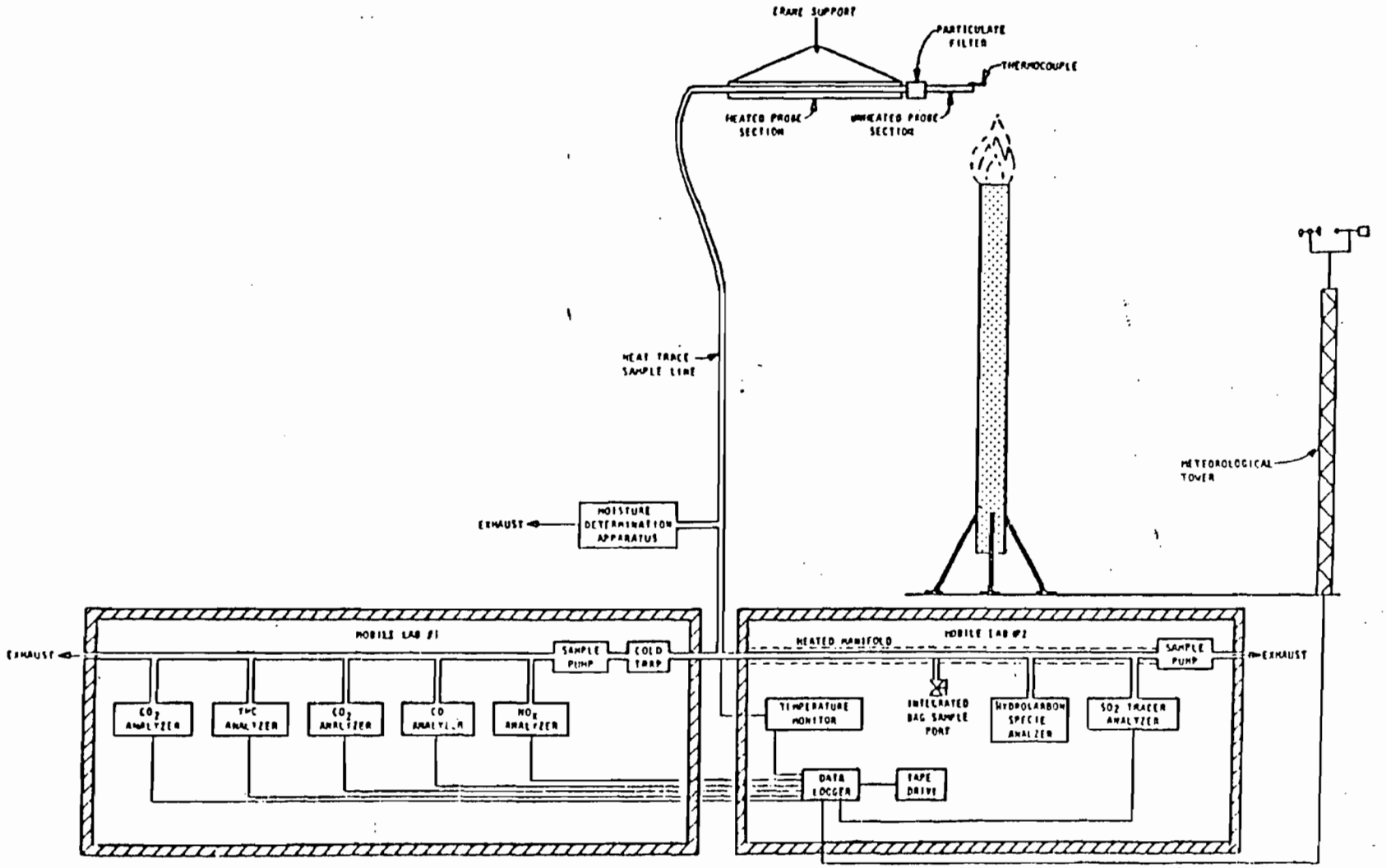
- Flares are generally an efficient means of hydrocarbon disposal over a wide range of operating conditions.
- Excess steam may contribute to lower combustion efficiencies.
- Flaring high volumes of low heating value gases may result in lower combustion efficiencies.
- Smoking flares do not necessarily indicate inefficient combustion.
- Although the use of sulfur as a tracer material shows promise, further development of the techniques are required.
- When the flares were operated under conditions that represent typical industrial operations, the combustion efficiencies observed at the sampling probe were equal to or greater than those commonly found in ambient air.

TABLE 1.1

FLARE EFFICIENCY TEST RESULTS

| Test Number | Flare Gas Flow (SCFM) | Flare Gas Heating Value (Btu/SCF) | Steam-to-Flare Gas Ratio (Lb/Lb) | Combustion Efficiency (%) | Comments |
|---|---|---|---|---|---|
| STEAM-ASSISTED FLARE TESTS | | | | | |
| 2 | 464 | 2183 | 0.508 | 99.82 | |
| 3 | 456 | 2183 | 0.448 | 99.82 | Incipient smoking flare |
| 1 | 473 | 2183 | 0.686 | 99.96 | |
| 5 | 149 | 2183 | 1.56 | 99.94 | |
| 67 | 148 | 2183 | 0.725 | -- | Sampling probe in flare flame |
| 7 | 154 | 2183 | 0.757 | 99.84 | Incipient smoking flare |
| 17 | 24.5 | 2183 | 0.926 | 99.84 | |
| 50 | 24.4 | 2183 | 3.07 | 99.45 | |
| 51 | 325 | 309 | 0.168 | 98.66 | |
| 23 | 0.494 | 267 | -- | 100.01 | |
| 52 | 0.556 | 268 | 77.5 | 98.82 | |
| 53 | 0.356 | 209 | 123 | 99.40 | |
| 54 | 0.356 | 209 | -- | 99.90 | |
| 4 | 283 | 2183 | -- | 99.80 | Smoking flare |
| 8 | 157 | 2183 | -- | 98.81 | Smoking flare |
| 55 | 24.7 | 2183 | 6.86 | 68.95 | Steam-quenched flare |
| 56 | 24.5 | 2183 | 3.45 | 99.70 | |
| 11a | 660 | 305 | -- | 99.79 | |
| 11b | 599 | 342 | -- | 99.86 | |
| 11c | 556 | 364 | -- | 99.82 | |
| 57 | 703 | 294 | 0.150 | 99.90 | |
| 16a | 320 | 339 | -- | 99.73 | No smoke |
| 16b | 252 | 408 | -- | 99.75 | No smoke |
| 16c | 194 | 519 | -- | 99.74 | Incipient smoking flare |
| 16d | 159 | 634 | -- | 99.78 | Smoking flare |
| 59a | 591 | 192 | -- | 97.95 | |
| 59b | 496 | 232 | -- | 99.33 | |
| 60 | 334 | 298 | -- | 98.92 | |
| 61 | 25.0 | 2183 | 5.67 | 82.18 | Steam-quenched flame |
| AIR-ASSISTED FLARE TESTS | | | | | |
| 28 | 157 | 2183 | -- | 99.94 | |
| 31 | 22.7 | 2183 | -- | 99.17 | |
| 26a | 481.6 | 2183 | -- | 100.00 | |
| 26b | 481.6 | 2183 | -- | 99.95 | |
| 66 | 639 | 158 | -- | 61.94 | Detached flame observed |
| 29a | 510 | 168 | -- | 54.13 | Detached flame; no air assistance |
| 29b | 392 | 146 | -- | 64.03 | Detached flame; with air assistanc |
| 33 | 0.714 | 83 | -- | 98.24 | |
| 32a | 0.556 | 294 | -- | 98.94 | |
| 32b | 0.537 | 228 | -- | 98.82 | |
| 62 | 217 | 153 | -- | 94.18 | Flame slightly detached |
| 64 | 249 | 282 | -- | 99.74 | |
| 63 | 121 | 289 | -- | 99.37 | |
| 65 | 159 | 2183 | -- | 99.57 | Smoking flare; no air assistance |

# FLARE SAMPLING AND ANALYSIS SYSTEM



ATTACHMENT C

HARRIS SEMICONDUCTOR

CURRENT AIR PERMITS

CURRENT AIR PERMITS--HARRIS SEMICONDUCTOR--AUGUST 21, 1987

| PERMIT NO. | SCRUB # | ISSUED | EXPIRES |
|---|---|---|---|
| AC 05-104512 | F63S02 | 01/15/86 | 06/30/86 |
| AC 05-104513 | F62S02 | 01/15/86 | 06/30/86 |
| AC 05-104515 | F59S03 | 01/15/86 | 06/30/86 |
| AC 05-104519 | F61S01 | 01/15/86 | 06/30/86 |
| AC 05-104521 | F58S01 | 01/15/86 | 06/30/86 |
| AC 05-104522 | F57S01 | 01/15/86 | 06/30/86 |
| AC 05-104523 | F55S01 | 01/15/86 | 06/30/86 |
| AC 05-104524 | F04S03 | 01/15/86 | 06/30/86 |
| AC 05-104525 | F04S01 | 01/15/86 | 06/30/86 |
| AC 05-104527 | F58S02 | 01/15/86 | 06/30/86 |
| AC 05-108260 | F63S03 | 02/28/86 | 06/30/86 |
| AO 05-109845 | N/A (F04SC7) | 11/05/85 | 10/30/90 |
| AO 05-109846 | N/A (F04S06) | 11/05/85 | 10/30/90 |
| AO 05-109850 | F04S04 | 11/05/85 | 10/30/90 |
| AO 05-109852 | N/A (F04S08) | 11/05/85 | 10/30/90 |
| AO 05-109853 | F51S02 | 11/05/85 | 10/30/90 |
| | F51S03 | 11/05/85 | 10/30/90 |
| AO 05-109855 | F51S04 | 11/05/85 | 10/30/90 |
| AO 05-115803 | F04S02 | 05/20/86 | 05/22/91 |
| AO 05-115804 | F54S03 | 05/20/86 | 05/22/91 |
| | F54S04 | 05/20/86 | 05/22/91 |
| AO 05-117084 | F60S01 | 05/20/86 | 05/22/91 |
| AO 05-117085 | F51S01 | 05/20/86 | 05/22/91 |
| AO 05-121924 | F59S01 | 09/17/86 | 09/14/91 |
| AO 05-121927 | F62S01 | 09/18/86 | 09/14/91 |
| AO 05-121930 | F63S01 | 09/16/86 | 09/14/91 |
| AO 05-121934 | F04S05 | 09/16/86 | 09/14/91 |
| AO 05-121939 | F61S02 | 09/16/86 | 09/14/91 |
| AO 05-65408 | F54S01 | 05/03/83 | 05/02/88 |
| | F54S02 | 05/03/83 | 05/02/88 |
| AO 05-71405 | F51S05 | 09/13/83 | 09/12/88 |

ATTACHMENT D

HARRIS SEMICONDUCTOR

EMISSIONS CALCULATIONS

# Calculations - Flare Permit

$$90 \frac{\text{lb } H_2S/\text{day}}{24 \text{ hr/day}} = 3.75 \text{ lb/hr } H_2S.$$

$$1200 \frac{\text{lb } CO_2/\text{day}}{24 \text{ hr/day}} = 50 \text{ lb/hr}$$

$H_2S + {}^3O_2 = SO_2 + H_2O.$
$2H_2S + 3\ O_2 = 2\ SO_2 + 2\ H_2O.$

1 mol $H_2S$ = 34g
1 mol $SO_2$ = 64g

grams x $(2.205 \times 10^{-3})$ = lbs

at 100% efficiency (assuming all $H_2S$ converted:)

$$(3.75 \frac{\text{lb } H_2S}{\text{hr}}) \left(\frac{1\text{g}}{2.205 \times 10^3 \text{lb}}\right) \left(\frac{1 \text{ mol } H_2S}{34\text{g}}\right) \left(\frac{1 \text{ mol } SO_2}{1 \text{ mol } H_2S}\right) \left(\frac{64\text{g } SO_2}{1 \text{ mol } SO_2}\right)$$

= 3201.3 g/hr $SO_2$ emited.

$$(3201.3 \frac{\text{g}SO_2}{\text{hr}}) \left(\frac{2.205 \times 10^{-3} \text{ lb}}{1\text{g}}\right) = 7.059 \frac{\text{lbs}}{\text{hr}}$$ max rate of $SO_2$ emitted

$$(7.059 \frac{\text{lbs } SO_2}{\text{hr}}) \left(\frac{1 \text{ Ton}}{2.0 \times 10^3 \text{ lb}}\right) \left(\frac{24 \text{ hr}}{1 \text{ day}}\right) \left(\frac{365 \text{ day}}{\text{yr}}\right)$$

= 30.92 Ton/day $SO_2$

$H_2S$: Based on 98.5% Efficiency of flare sytem:

$$(32850 \frac{\text{lbs } H_2S}{\text{year}}) \ (0.985) = 32357.25 \frac{\text{lbs}}{\text{yr}}$$ of $H_2S$ converted

$32850 - 32357.25 = 492.75 \frac{\text{lbs}}{\text{yr}}$ potential $H_2S$ emission

$$(492.75 \frac{\text{lbs}}{\text{yr}}) \left(\frac{1 \text{ yr}}{365 \text{ day}}\right) \left(\frac{1 \text{ day}}{24 \text{ hr}}\right) = 0.05625 \text{ lb/yr}$$ potential $H_2$ emision

$$(492.75 \frac{\text{lbs } H_2S}{\text{yr}}) \left(\frac{1 \text{ Ton}}{2.0 \times 10^3 \text{ lb}}\right) = 0.246 \text{ Ton/year}$$

$$\underline{CO_2} \ (438.000 \frac{\text{lbs } CO_2}{\text{yr}}) \ (0.985) = 431430 \frac{\text{lbs } CO_2}{\text{yr}}$$ removed

438.000 - 431430 = 6570 $\frac{\text{lbs } CO_2}{\text{yr}}$ potential emission

$$(6570 \frac{\text{lbs } CO_2}{\text{yr}}) \left(\frac{1 \text{ yr}}{365 \text{ day}}\right) \left(\frac{1 \text{ day}}{24 \text{ hr}}\right) = 0.75 \frac{\text{lb } CO_2}{\text{hr}}$$

$$(6570 \frac{\text{lb}}{\text{yr}}) \left(\frac{1 \text{ Ton}}{2.0 \times 10^3 \text{ lb}}\right) = 3.285 \frac{\text{Ton } CO_2}{\text{yr}}$$

Enrichment Fuels: (2.5#/hr propane) $\left(\frac{ft^3}{0.117\#}\right)$ = 21.37 SCFH

1# Propane = 21,591 BTU

Enrichment gas--> (2.5 lb/hr) $\left(\frac{21591 \text{ BTU}}{\text{lb}}\right)$ = 53977.5 BTU/hr

Pilot gas--> (43 $FT^3$/hr) $\left(\frac{0.117 \text{ lb}}{FT^3}\right) \left(\frac{21591 \text{ BTU}}{\text{lb}}\right)$ == 108624.32 $\frac{\text{BTU}}{\text{hr}}$

$C_3H_8$ at STP --> (1.8324 $\frac{g}{L}$) $\left(\frac{1 \times 10^{-3} \text{ L}}{1 \text{ m}^3}\right)$ = $1.83 \times 10^{-3}$ $\frac{g}{m^3}$

Gas Flow Rate:

$H_2S = \frac{0.0892 \text{ lb}}{ft^3}$

$$(90 \frac{\text{lb } H_2S}{\text{day}}) \left(\frac{1 \text{ day}}{24 \text{ hr}}\right) \left(\frac{1 \text{ hr}}{60 \text{ min}}\right) \left(\frac{ft^3}{0.0892 \text{ lb}}\right) = 0.7007 \text{ CFM } H_2S$$

$CO_2 = \frac{0.1144 \text{ lb}}{ft^3}$

$$(1200 \frac{\text{lb } CO_2}{\text{day}}) \left(\frac{1 \text{ day}}{24 \text{ hr}}\right) \left(\frac{1 \text{ hr}}{60 \text{ min}}\right) \left(\frac{ft^3}{0.1144 \text{ lb}}\right) = 7.284 \text{ CFM } CO_2$$

0.7007 CFM + 7.284 CFM = 7.985 CFM Gas

Velocity:

(based on 2" Inlet from degasifier to flare)

2" Pipe area = 0.0233 $ft^2$

$$\frac{7.985 \text{ ft}^3/\text{min gas}}{0.0233 \text{ ft}^2} = 342.7 \text{ ft/min} \div 60 = 5.712 \text{ ft/sec}$$

TABLE 2

Sample Designation: New Feed Water Well for 58
Sample Analyzed by: S. Slasor, K. Hanley - Harris Corporation
Sample Analyzed: 8/08/86

| REPORT OF ANALYSIS | MEASUREMENT UNITS |
|---|---|
| Total Dissolved Solids | 2143-2175 mg/l |
| Suspended Solids | 1.2-1.7 mg/l |
| Total Hardness as $CaCO_3$ | 659 mg/l |
| Calcium | 122 mg/l |
| Magnesium | 86 mg/l |
| Sodium | 381 mg/l |
| Iron | < 0.1 mg/l |
| Manganese | < 0.1 mg/l |
| Sulphate | 117 mg/l |
| Alkalinity | 145 mg/l |
| Bicarbonate Alkalinity | < 0.5 mg/l |
| Carbonate Alkalinity | < 0.5 mg/l |
| Chloride | 870 mg/l |
| Copper | < 0.1 mg/l |
| Lead | < 0.1 mg/l |
| Barium | < 0.5 mg/l |
| Silica | 21.7 mg/l |
| Total Organic Carbon | 9.4 mg/l |
| Nitrate | < 1 mg/l |
| Potassium | 8.5 mg/l |
| Hydrogen Sulfide | 12.4-12.6 mg/l |
| Carbon Droxide | < 0.1 mg/l |
| pH | 7.35 |
| Temperature | 25.5°C |
| Conductivity, mucromho/cm | 3330 |

RO UNIT PERFORMANCE PROJECTION
using "ROPRO" (c) v3.03U (1/16/87)
Provided to the San Diego Office
by Fluid Systems Division of UOP Inc.

PROJECT: PILOT DATE: 7/9/87
The unit has 32 Model 8031MP MAGNUM elements which are 1 yrs. old.
The Array is 5 / 3 with 4 element tubes
Permeate Flow = 288000. gpd ( 200.0 gpm) at 75.0% recovery.
Feed Temp. = 25.0 C ( 77.0 F) Avg. annual unit Temp. = 25.0 C ( 77.0 F)
Feed Press. = 378.9 psi Brine Press. = 339.5 psi
Feed Osmotic Press. = 21.2 psi Brine Osmotic Press. = 82.4 psi
The ratio of the concentration in the brine to the saturation level for
CaSO4 is 1.16 SiO2 is .52 SrSO4 is 2.52

If the precipitation inhibitor addition is interrupted for even a short time, the elements may become irreversibly fouled with CaSO4.

| BANK | FEED TOTAL gpm | FEED TUBE gpm | CONCENTRATE TOTAL gpm | CONCENTRATE TUBE gpm | AVERAGE ELEMENT gpd | TUBE DELTA P psi | FINAL BETA | ELEMENT % RECOVERY |
|---|---|---|---|---|---|---|---|---|
| 1 | 266.7 | 53.3 | 134.6 | 26.9 | 9510.9 | 22.4 | 1.099 | 18.9 |
| 2 | 134.6 | 44.9 | 66.8 | 22.3 | 8127.2 | 17.1 | 1.098 | 18.8 |

| | RAW FEED mg/L | PRETREATED FEED mg/L | CONCENTRATE mg/L | PERMEATE mg/L |
|---|---|---|---|---|
| Ca | 310. | 310. | 1233. | 1.4 |
| Mg | 80. | 80. | 318. | .4 |
| Na | 405. | 405. | 1551. | 21.7 |
| K | 9. | 9. | 33. | .5 |
| NH4 | 0. | 0. | 0. | .0 |
| CO3 | 0. | 0. | 0. | .0 |
| HCO3 | 64. | 64. | 253. | 4.9 |
| SO4 | 572. | 572. | 2281. | .2 |
| Cl | 1120. | 1120. | 4358. | 36.8 |
| NO3 | 1. | 1. | 4. | .1 |
| F | 2. | 2. | 7. | .0 |
| SiO2 | 18. | 18. | 65. | 2.8 |
| Sr | 13.40 | 13.40 | 53.28 | .06 |
| SUM | 2594. | 2594. | 10156. | 64.8 |
| TDS | 2562. | 2562. | 10029. | 64.3 |
| CO2 | 542. | 542. | 542. | 539. |
| pH | 5.3 | 5.3 | 5.9 | 4.2 |
| pHs | | 7.3 | 6.7 | |

This projection is the anticipated performance and is based on nominal properties of the elements. No allowance was made for fouling or for pressure losses in the manifolds.
This computer printout should not be considered a guarantee of system performance unless accompanied by a statement to that effect.

By BRENDA

ATTACHMENT E

HARRIS SEMICONDUCTOR

MATERIAL SAFETY DATA SHEETS

AIRCO
Division of The BOC Group, Inc
575 Mountain Avenue
Murray Hill
New Jersey 07974
Telephone: 201-464-8100
TWX: 710-984-7970

# MATERIAL SAFETY DATA SHEET

Welding Consumables
and Related Products
Conforms to OSHA 1910.1200

## IDENTIFICATION

PRODUCT NAME: Hydrogen Sulfide

SYNONYMS: Dihydrogen Sulfide

CAS NUMBER: 7783-06-4

FORMULA: $H_2S$

CHEMICAL FAMILY: Nonmetal Hydride

DOT HAZARD CLASS: Flammable Gas

DOT IDENTIFICATION NUMBER: UN 1053

CHEMTREC: 800-424-9300

## HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT:

10 Molar PPM; STEL = 15 molar PPM (ACGIH, 1984-85). 20 PPM - Ceiling, 50 PPM - Peak for 10 minutes (OSHA).

SYMPTOMS OF EXPOSURE:

Continuous exposure to low (15-50 PPM) concentrations will generally cause irritation to mucous membranes and conjunctivae of the eyes. It may also cause headache, dizziness or nausea. Higher concentrations (200-300 PPM) can result in respiratory arrest leading to coma or unconsciousness. Exposures for more than 30 minutes at concentrations of greater than 700 PPM have been fatal. Continuous inhalation of low concentrations may cause olfactory fatigue or paralysis rendering the detection of its presence by odor ineffective.

TOXICOLOGICAL PROPERTIES:

Inhalation of hydrogen sulfide it is highly toxic. It is also an irritant to mucous tissue, membranes and the conjunctivae of the eyes. Continued exposure renders the olfactory sensors inopertive. Toxicologically its reaction with enzymes in the bloodstream inhibit cell respiration resulting in pulmonary paralysis, sudden collapse and death. This overshadows its irritant effect on mucous membranes and tissues which at worst will cause pulmonary edema or conjunctival lesions. Repeated exposures to low concentrations is reported to cause conjunctivites, photophobea, corneal bullae, tearing, pain and blurred vision.

RECOMMENDED FIRST AID TREATMENT:

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO HYDROGEN SULFIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. RESCUE PERSONNEL SHOULD RECOGNIZE THE HAZARDS OF OVEREXPOSURE DUE TO OLFACTORY FATIGUE.

Inhalation: Extreme fire hazard when rescuing semi-conscious or unconscious persons due to flammability of hydrogen sulfide. Avoid use of rescue equipment which might contain ignition sources or cause static discharge. Move affected person to any uncontaminated area. If breathing has stopped, give assisted respiration. Oxygen or a mixture of 5% carbon dioxide in oxygen should be administered by a qualified person. Keep the victim warm and calm. Seek immediate medical assistance. Further treatment should be symptomatic and supportive.

Eye Contact: PERSONS WITH POTENTIAL EXPOSURE TO HYDROGEN SULFIDE SHOULD NOT WEAR CONTACT LENSES.

Flush contaminated eye(s) with copious quantities of water. Part eyelids with fingers to assure complete flushing. Continue for minimum of 15 minutes.

Hazardous Mixtures of Other Liquids, Solids, or Gases:

Hydrogen sulfide will explode or burn over a wide range or mixtures in air. It becomes dangerously reactive when mixed with nitric acid or other strong oxidizers such as sulfuric acid. Vapors will combust spontaneously when mixed with vapors of chlorine, oxygen difluoride or nitrogen trifluoride.

## PHYSICAL DATA

Boiling Point: -76°F (-60°C)

Liquid Density @ Boiling Point: 57.1 $lb/ft^3$ (915 $kg/m^3$)

Vapor Pressure @ 70°F (21.1°C): 267 psia (1840 kPa)

Specific Gravity @ 70°F, 1 atm (Air=1): 1.21

Solubility in Water: Soluble

Freezing Point: -117°F (-82.8°C)

Appearance and Odor: Shipped and stored as a liquid under its own vapor pressure. Vapor is colorless with a characteristic "rotten egg" odor.

## FIRE/EXPLOSION HAZARDS DATA

Flash Point (Method Used): Gas

Auto Ignition Temperature: 554° (290°C)

LEL: 4.0 UEL: 44.0

Extinguishing Media: Carbon dioxide, dry chemical or water spray

Electrical Classification: NEC Class 1

Special Fire Fighting Procedures: Shut off flow of gas. Cool surrounding fire-exposed containers with water spray. Fire fighters should use self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: Hydrogen sulfide is heavier than air so may accumulate in low spots and may "travel" a considerable distance to a flame or other source of ignition.

## REACTIVITY DATA

Stability: Stable

Conditions to Avoid: Avoid heat, flame or other sources of ignition.

Incompatibility (Materials to Avoid): Concentrated nitric acid, chlorine, nitrogen trifluoride, oxygen difluoride or other strong oxidizing agents.

Hazardous Decomposition Products:
Oxides of sulfur

Hazardous Polymerization: Will not occur

Conditions to Avoid: None

## SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact CHEMTREC for emergency assistance or call your closest Airco location.

Waste Disposal Method:

Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to Airco for proper disposal.

## SPECIAL PROTECTION INFORMATION

Respiratory Protection: Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

Ventilation: Hood with forced ventilation.

Local Exhaust: To prevent accumulation above the TWA.

Special: None

Mechanical (Gen.): None

Other None

Protective Gloves: Neoprene or butyl rubber, PVC, polyethylene.

Eye Protection: Safety goggles or glasses.

Other Protective Equipment: Safety shoes, safety shower, eyewash "fountain".

## SPECIAL PRECAUTIONS

Special Labeling Information:

DOT Shipping Name: Hydrogen sulfide (RQ-100/45.4)
DOT Shipping Label: Flammable Gas and Poison
DOT Hazard Class: Flammable Gas
I.D. No.: UN 1053

Special Handling Recommendations:

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<750 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult Compressed Gas Asssociation Pamphlets P-1 and G-12.

Special Storage Recommendations:

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130°F (54°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional recommendations, consult Compressed Gas Association Pamphlets P-1 and G-12.

Special Packaging Recommendations:

Many metals corrode rapidly with wet hydrogen sulfide. Anhydrous (water content -40f or C) hydrogen sulfide can be handled in carbon steel, aluminum, Inconel®, Stellite® and 304 and 316 stainless steels. Avoid hard steels which are highly stressed since they may be susceptible to hydrogen embrittlement from hydrogen sulfide.

Other Recommendations or Precautions:

Earth-ground and bond all lines and equipment associated with the hydrogen sulfide system. All electrical equipment should be non-sparking or explosion proof. Do not rely on the olfactory sense to detect the presence of hydrogen selenide. Analytical devices and instumentation are readily available for this purpose. Perform frequent analytical tests to be certain that the TWA is not exceeded.

Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

AIRCO
Division of The BOC Group, Inc
575 Mountain Avenue
Murray Hill
New Jersey 07974
Telephone: 201-464-8100
TWX: 710-984-7970

# MATERIAL SAFETY DATA SHEET

Welding Consumables
and Related Products
Conforms to OSHA 1910.1200

## IDENTIFICATION

PRODUCT NAME: Sulfur Dioxide

SYNONYMS: Sulfurous Acid Anhydride

CAS NUMBER: 7446-09-5

FORMULA: $SO_2$

CHEMICAL FAMILY: Inorganic Acid

DOT HAZARD CLASS: Nonflammable Gas

DOT IDENTIFICATION NUMBER: UN 1079

CHEMTREC: 800-424-9300

## HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT:

2 Molar PPM (ACGIH, 1984-85). 5 Molar PPM (OSHA, 1984-85).

Note: Prior to the 1984-85 issue of ACGIH's "TLVs Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment and Biological Exposure Indices with Intended Changes", Sulfur Dioxide had a STEL of 5 Molar PPM. This STEL value is deleted in the 1984-85 issue.

SYMPTOMS OF EXPOSURE:

Corrosive and irritating to the upper and lower respiratory tracts, skin and eyes. Symptoms depend on the concentration and duration of exposure and vary from mild irritation to severe destruction of tissues. They may also include burning sensations, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. If the sulfur dioxide penetrates the lower airway, it can produce bronchitis, chemical pneumonitis and pulmonary edema. Eye contact results in pain, lacrymation, inflammation, swelling of tissue and possible destruction of the eye. Skin contact causes irritation or chemical-like burns. Contact with rapidly evaporating liquid can cause cryogenic "burns" or frostbite.

TOXICOLOGICAL PROPERTIES:

Inhalation human $TC_{LO}$ = 3 PPM/5 days

Exposure to atmospheres contaminated with sulfur dioxide is extremely irritating. Its odor and prompt irritant action provide a warning of exposure to toxic conditions. High concentrations are extremely destructive to tissues of the airway, eyes and skin. Inhalation may have fatal consequences as a result of spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Exposure of the eyes to high concentrations may result in ulceration of the conjunctiva and cornea and destruction of all ocular tissues. Contact with the skin causes severe burns. Systemic toxicity due to sulfur dioxide is not known to occur. Frost-bite effects are a change in color of the skin to gray or white, possibly followed by blistering.

RECOMMENDED FIRST AID TREATMENT:

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO SULFUR DIOXIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Unconscious persons should be moved to an uncontaminated area, and given mouth-to-mouth resuscitation and supplemental oxygen. Keep the victim warm and quiet. Assure that mucous or vomited material does not obstruct the airway by positional drainage. The physician should be informed that the patient has inhaled acidic vapors.

Eye Contact: PERSONS WITH POTENTIAL EXPOSURE TO SULFUR DIOXIDE SHOULD NOT WEAR CONTACT LENSES.

Flush contaminated eye(s) with copious quantities of water. Part eyelids to assure complete flushing. Continue for a minimum of 15 minutes.

Skin Contact: Flush affected area with copious quantities of water. Remove affected clothing as rapidly as possible.

Dermal Contact or Frostbite: Remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if the cryogenic "burn" has resulted in blistering of the dermal surface or deep tissue freezing.

Hazardous Mixtures of Other Liquids, Solids, or Gases:

Sulfur dioxide reacts violently with peroxides, chromates, bichromates, permanganates and oxygen difluoride. It also reacts with chlorates to form chlorine which at elevated temperatures may become an exlosive reaction.

## PHYSICAL DATA

Boiling Point: 14.0°F (-10.0°C)

Liquid Density @ Boiling Point: 91.1 $lb/ft^3$ (1460 $kg/m^3$)

Vapor Pressure @ 70°F (21.1°C): 49.1 psia (339 kPa)

Specific Gravity @ 70°F, 1 atm (Air=1): 2.26

Solubility in Water: Soluble

Freezing Point: Gas Mixtures; -103.9°F (-75.5°C)

Appearance and Odor: Colorless gas with highly irritating, pungent odor.

## SPECIAL PROTECTION INFORMATION

Respiratory Protection:

Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

Ventilation: Hood with forced ventilation

Local Exhaust: To prevent accumulation above the TWA.

Special: N/A

Mechanical (Gen.): N/A

Other: N/A

Protective Gloves: Plastic or rubber

Eye Protection: Safety goggles or glasses.

Other Protective Equipment: Safety shoes, safety shower, eyewash "fountain", face shield.

## SPECIAL PRECAUTIONS

Special Labeling Information:

DOT Shipping Name: Sulfur dioxide
DOT Shipping Label: Nonflammable gas
DOT Hazard Class: Nonflammable gas
I.D. No.: UN 1079

Special Handling Recommendations:

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure ($<150$) psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult Compressed Gas Asssociation's Pamphlet P-1 and G-3.

Special Storage Recommendations:

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130°F (54°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional storage recommendations, consult Compressed Gas Association's Pamphlet P-1 and G-3.

## FIRE/EXPLOSION HAZARDS DATA

Flash Point (Method Used): None

Auto Ignition Temperature: None

LEL: None UEL: None

Extinguishing Media: Nonflammable gas

Electrical Classification: Nonhazardous

Special Fire Fighting Procedures: None

Unusual Fire and Explosion Hazards: None

## REACTIVITY DATA

Stability: Stable

Conditions to Avoid: None

Incompatibility (Materials to Avoid): Oxidizing materials.

Hazardous Decomposition Products: None

Hazardous Polymerization: Will not occur

## SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact CHEMTREC for emergency assistance or your closest Airco location.

Waste Disposal Method:

Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to Airco for proper disposal.

Special Packaging Recommendations:

Most metals corrode rapidly with wet sulfur dioxide.

Other Recommendations or Precautions:

Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

HARRIS SEMICONDUCTOR
A DIVISION OF HARRIS CORPORATION

TITLE: CARBON DIOXIDE

CONTROLLED

DOCUMENT

# PROPRIETARY DATA

VERTICAL BAR IN RIGHT MARGIN INDICATES REVISION.

| | | | |
|---|---|---|---|
| CHEMICAL SAFETY SPECIFICATION | CODE IDENT. NO. 34371 | REVISION | |
| | | SPECIFICATION NUMBER 856068 | |
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## 1.0 PURPOSE

This specification defines the chemical safety requirements for Carbon Dioxide supplied by the applicable manufacturer(s) or distributor(s) of the product.

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| CARBON DIOXIDE | D | 856068 |

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July 1986

# MATERIAL SAFETY DATA SHEET

*An explanation of the terms used herein may be found in OSHA 29 CFR 1910.1200, available from OSHA regional or area offices.*

(Similar to U.S. Department of Labor Form OMB No. 1218-0072 and generally accepted in Canada for information purposes)
Do Not Duplicate This Form. Request an Original.

| | | | |
|---|---|---|---|
| **PRODUCT** | Carbon Dioxide | | |
| **CHEMICAL NAME** | Carbon Dioxide | **SYNONYMS** | Carbonic Anhydride, Carbonic Acid Gas |
| **FORMULA** | $CO_2$ | **CHEMICAL FAMILY** | Acid Anhydride |
| | | **MOLECULAR WEIGHT** | 44.01 |
| **TRADE NAME** | Carbon Dioxide | | |

For mixtures of this product request the respective component Material Data Safety Sheets. See Section IX.

| MATERIAL (CAS NO.) | Wt (%) | 1985-1986 ACGIH TLV-TWA (OSHA-PEL) |
|---|---|---|
| Carbon Dioxide (124-38-9) | 100 | 5000 ppm (5000 ppm) |

| | | | |
|---|---|---|---|
| **SUBLIMATION POINT, 760 mm. Hg** | −78.5°C (−109.3°F) | **FREEZING POINT** | Not applicable |
| **SPECIFIC GRAVITY ($H_2O$ = 1)** | Not applicable | **VAPOR PRESSURE AT 21°C.** | 830 psig |
| **VAPOR DENSITY (air = 1)** | 1.522 @ 21°C | **SOLUBILITY IN WATER, % by wt.** | Slight |
| **PERCENT VOLATILES BY VOLUME** | 100 | **EVAPORATION RATE (Butyl Acetate = 1)** | High |

**APPEARANCE AND ODOR** Colorless gas at normal temperature and pressure; odorless.

IN CASE OF EMERGENCIES involving this material, further information is available at all times:
In the USA 1-800-UCC-HELP (1-800-822-4357) In Canada 514 — 645-5311
*For routine information contact your local supplier*

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Union Carbide requests the users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

**UNION CARBIDE CORPORATION ☐ LINDE DIVISION**
**UNION CARBIDE CANADA LIMITED ☐ LINDE DIVISION**





| TITLE | REVISION | SPECIFICATION NUMBER |
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| CARBON DIOXIDE | 1 | 856068 |

HARRIS SEMICONDUCTOR
A DIVISION OF HARRIS CORPORATION



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**PRODUCT:** Carbon Dioxide

L-4574-B
July 1986

**THRESHOLD LIMIT VALUE:** 5,000 ppm – ACGIH (1985-86).

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**EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:**

**SWALLOWING** — A highly unlikely route of exposure. Frostbite of the lips and mouth may result from contact with the liquid.

**SKIN ABSORPTION** — No evidence of adverse effects from available information.

**INHALATION** — Asphyxiant. Moderate concentrations may cause headache, drowsiness, dizziness, stinging of the nose and throat, excitation, rapid breathing, excess salivation, vomiting, and unconsciousness. Lack of oxygen can cause death.

**SKIN CONTACT** — No harmful effect expected from vapor. Liquid may cause frostbite.

**EYE CONTACT** — Vapor may cause a stinging sensation; liquid may cause frostbite.

**EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:** No evidence of adverse effects from available information.

**OTHER EFFECTS OF OVEREXPOSURE:** Damage to retinal ganglion cells and central nervous system may occur.

**MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:** A knowledge of the available toxicology information and of the physical and chemical properties of the material suggest that overexposure is unlikely to aggravate existing medical conditions.

**SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:** None currently known.

**EMERGENCY AND FIRST AID PROCEDURES:**

**SWALLOWING** — This product is a gas at normal temperature and pressure.

**SKIN CONTACT** — For exposure to liquid, immediately warm frostbite area with warm water (not to exceed 105°F). In case of massive exposure, remove clothing while showering with warm water. Call a physician.

**INHALATION** — Remove to fresh air. Give artificial respiration if not breathing. Give oxygen if breathing is difficult. Call a physician.

**EYE CONTACT** — In case of splash contamination, immediately flush eyes thoroughly with water for at least 15 minutes. See a physician, preferably an ophthalmologist, immediately.

***NOTE TO PHYSICIAN:*** *There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition.*

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| | | | |
|---|---|---|---|
| **FLASH POINT** (test method) | Not applicable | **AUTOIGNITION TEMPERATURE** | Not applicable |
| **FLAMMABLE LIMITS IN AIR, % by volume** | **LOWER** Not applicable | **UPPER** | Not applicable |

**EXTINGUISHING MEDIA:** Carbon Dioxide cannot catch fire. Use media appropriate for surrounding fire.

**SPECIAL FIRE FIGHTING PROCEDURES:** Evacuate all personnel from danger area. Immediately deluge containers with water spray from maximum distance until cool, then move containers away from fire area if without risk.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** Gas cannot catch fire. Container may rupture due to heat of fire. No part of a container should be subjected to a temperature higher than 52°C (approximately 125°F). Most containers are provided with a pressure relief device designed to vent contents when they are exposed to elevated temperature.

| **STABILITY** | |
|---|---|
| **UNSTABLE** | **STABLE** |
| | X |

**CONDITIONS TO AVOID:** See Section IX.

**INCOMPATIBILITY (materials to avoid):** Alkali metals, alkaline earth metals, metal acetylides, chromium, titanium above 550°C, uranium above 750°C.

**HAZARDOUS DECOMPOSITION PRODUCTS:** In the presence of an electrical discharge, carbon dioxide is decomposed to form carbon monoxide and oxygen.

| **HAZARDOUS POLYMERIZATION** | |
|---|---|
| **May Occur** | **Will not Occur** |
| | X |

**CONDITIONS TO AVOID:** None currently known.

**STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED**

Evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Shut off leak if without risk. Ventilate area of leak or move leaking container to well-ventilated area. Test area, especially confined areas, for sufficient oxygen content prior to permitting re-entry of personnel.

**WASTE DISPOSAL METHOD:** Slowly release into atmosphere outdoors. Discard any product, residue, disposable container or liner in an environmentally acceptable manner, in full compliance with federal, state and local regulations.



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| TITLE: CARBON DIOXIDE | | REVISION: 1 | SPECIFICATION NUMBER: 856068 |
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**PRODUCT:** Carbon Dioxide

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**RESPIRATORY PROTECTION (specify type):** Select in accordance with OSHA 29 CFR 1910.134. Respirators shall be acceptable to MSHA and NIOSH.

| | |
|---|---|
| **VENTILATION** | **LOCAL EXHAUST** — Preferred |
| | **MECHANICAL (general)** — Acceptable |
| | **SPECIAL** — Not applicable |
| | **OTHER** — Not applicable |

**PROTECTIVE GLOVES:** Insulated Neoprene

**EYE PROTECTION:** Select in accordance with OSHA 29 CFR 1910.133

**OTHER PROTECTIVE EQUIPMENT:** Metatarsal shoes for cylinder handling. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133.

**CAUTION:** High pressure liquefied gas. Use piping and equipment adequately designed to withstand pressures to be encountered. Can cause rapid suffocation due to oxygen deficiency. Store and use with adequate ventilation. Close valve when not in use and when empty. Carbon dioxide, being heavier than air, tends to accumulate near the floor of an enclosed space displacing the air upward and creates an oxygen-deficient atmosphere. Ventilate space before entry. Verify sufficient oxygen concentration.

**MIXTURES:** When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Be sure to read and understand all labels and other instructions supplied with all containers of this product.

For safety information on general handling of compressed gas cylinders, obtain a copy of pamphlet P-1, "Safe Handling of Compressed Gases in Containers" from the Compressed Gas Association, Inc., 1235 Jefferson Davis Highway, Arlington, VA 22202.

**OTHER HANDLING AND STORAGE CONDITIONS:** Never work on a pressurized system. If there is a leak, close the cylinder valve, blow down the system by venting to a safe place, then repair the leak. Store in well ventilated, cool dark place.

The opinions expressed herein are those of qualified experts within Union Carbide. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and these opinions and the conditions of use of the product are not within the control of Union Carbide, it is the user's obligation to determine the conditions of safe use of the product.

LINDE
UNION CARBIDE

**GENERAL OFFICES**

IN THE USA:
Union Carbide Corporation
Linde Division
39 Old Ridgebury Road
Danbury, CT 06817-0001

IN CANADA:
Union Carbide Canada Limited
Linde Division
123 Eglinton Avenue East
Toronto, Ontario M4P 1J3

*Other offices in principal cities all over the world.*

L-4574-B 86-0926 7/86 10M

Lithographed in U.S.A.



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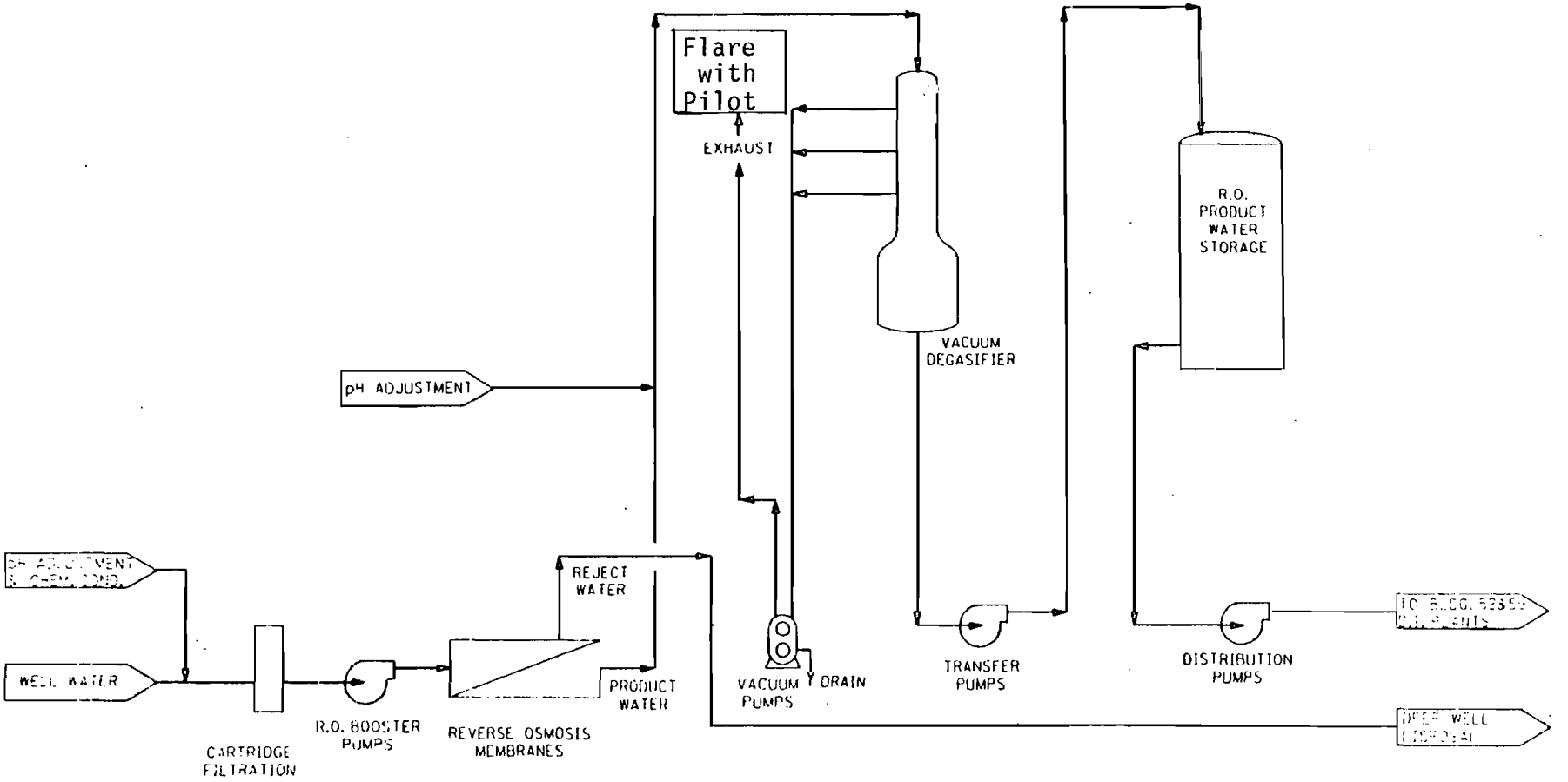
ATTACHMENT F

HARRIS SEMICONDUCTOR

SUPPLEMENTAL INFORMATION

# PROCESS FLOW DIAGRAM DRAWING NO. P-1

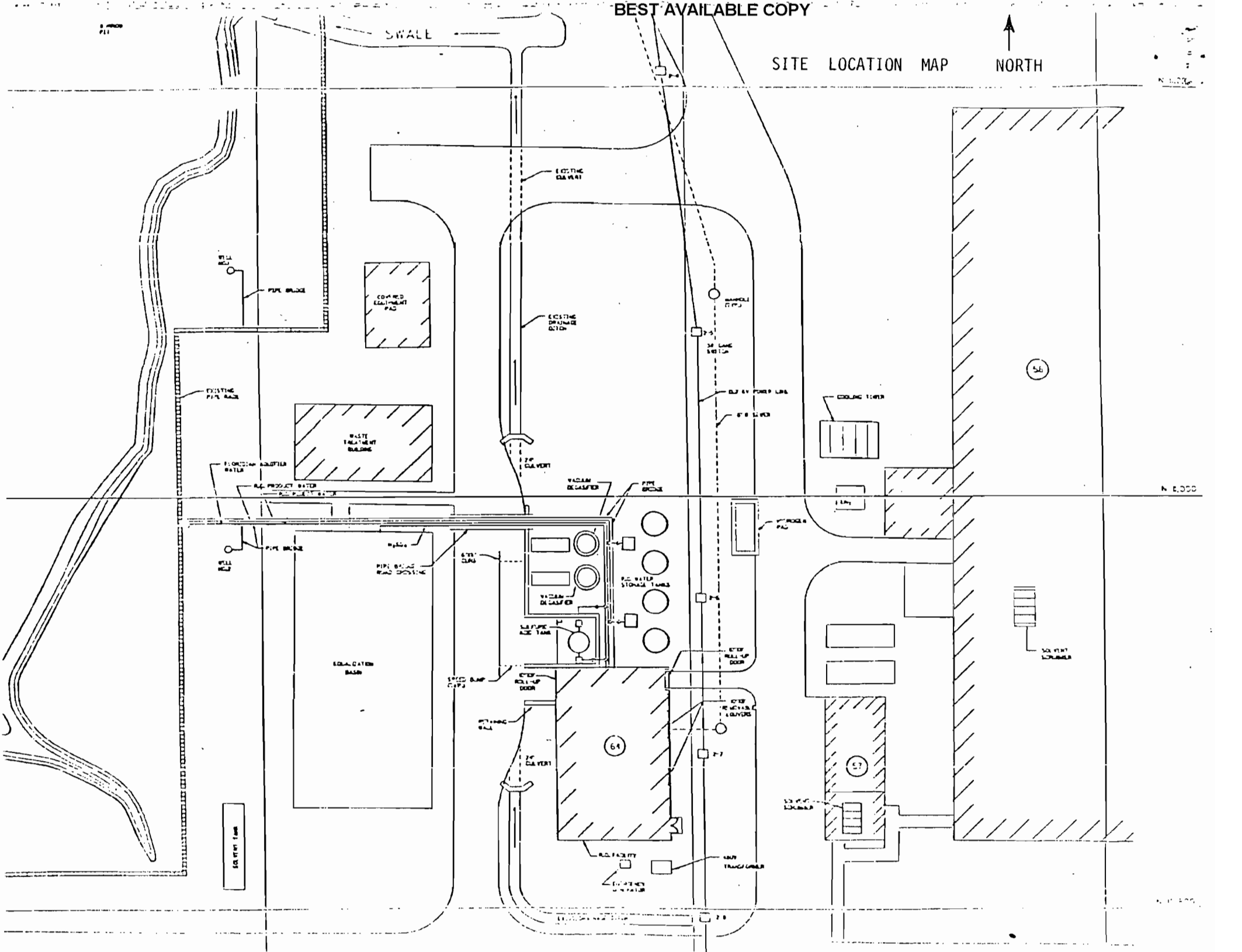



LOCKWOOD GREENE
Planners/Engineers/Architects/Managers

SHEET TITLE: PROCESS FLOW DIAGRAM INDUSTRIAL WATER SYSTEM

JOB NAME: HARRIS

SCALE: NONE



ATTACHMENT 2

Mailed 9/28/87 - WPPC

STATE OF FLORIDA

# DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

September 25, 1987

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. James R. Kolanek
Manager, Environmental Services
Harris Semiconductor
P. O. Box 883
Melbourne, Florida 32901

Dear Mr. Kolanek:

Re: Completeness Review on the Applications to Construct Air Pollution Sources
Permit Nos. AC 05-138794 and -138795

The Department received your cover letter dated August 28, 1987, and the above reference applications on August 31, 1987. Based on a review of these applications, they have been deemed incomplete. The following information, including all reference material, calculations and assumptions, will have to be submitted to the Department's Bureau of Air Quality Management before the status can, again, be ascertained.

AC 05-138794

1. For the volatile organic compounds and organic solvents, quantify the potential emissions per chemical in pounds per hour, month, and year.

2. What is the facility designated identification for the scrubber to be used to handle the gas cyclinder purges?

3. Where will the scrubber medium be discharged after collection occurs?

4. What is the scrubber's medium?

AC 05-138795

1. What is the heat capacity in Btu per gallon of the propane?

2. Quantify the potential pollutant emissions in pounds per hour and annually from the firing of the propane.

3. What is the maximum consumption of propane per hour?

4. Based on the submitted potential pollutant emissions, the appropriate processing fee, pursuant to FAC Rule 17-4.05, is $250.00. Therefore, remit to the Department of Environmental Regulation the amount deficient, which is $150.00.

If there are any questions, please call Bruce Mitchell at (904)488-1344 or write to me at the above address.

Sincerely,

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

CHF/BM/s

cc: T. Sawicki

ATTACHMENT 3

20 oct. 1987
Orlando, FL

HARRIS

DER
OCT 23 1987
BAQM

FS-NAB-71-88

October 16, 1987

Mr. C. H. Fancy, P.E.
Deputy Chief, Bureau of Air Quality Mgt.
State of Florida, DER
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399

Re: Completeness Review of Construction Applications
Permit No.: AC 05-138794
AC 05-138795

Dear Mr. Fancy:

This letter is in reply to your request of September 25, 1987, for further information regarding permits AC 05-138794 and 138795. The following information is pertinent to Permit No. AC 05-138794:

1. The only piece of equipment containing organics that is proposed to be attached to the exhaust fan F54E17 is a gas cabinet containing two K-gas cylinders of halocarbon-23 (trifluoromethane). Under normal operating conditions, no emissions of this fluorocarbon will occur. In the unlikely event that an entire cylinder should be lost, a maximum of 70.12 lbs. of organic compounds would be released into the exhaust system. The rate of release would depend on the nature of the leak.

2. The facility designated identification numbers for the scrubber systems that will handle gas cylinder purges are F54S03 and F54S04.

3 & 4.
The scrubber medium for F54S03 and F54S04 is water. After collection occurs, the water drains to the T112 sump where it is pumped to the wastewater treatment facility located on the Harris Semiconductor plant site. F54E17 is an exhaust fan with no control device.

The following information is pertinent to Permit No. AC 05-138795:

1. The heat capacity of propane is 330.39 BTU/gal.

2. In order to determine pollutant emissions generated by the firing of propane, design engineer Brian Duck of John Zink Co. was contacted. He explained that the flare pilot is a pre-mixed burner. The propane in the system is mixed with the process gases under the proper stoichiometric concentrations to allow for complete, smokeless combustion at the flare tip. This is performed under high pressure and high velocity conditions at the point of combustion. Consequently, propane burns clean and emissions attributed to propane are negligible.

3. Because the amount of both pilot and enrichment propane utilized will remain constant on the flare system, the maximum consumption of propane is equal to the average consumption stated in the permit application (43 SCFH for the pilot gas, and 21.37 SCFH for the enrichment gas).

4. We are currently processing the internal paper work for the deficient amount of $150.00. We shall forward the check under separate cover.

We trust the above information addresses all outstanding information. If you should have any questions, please feel free to contact me at (305) 724-7467.

Sincerely,

James R. Kolanek by SCP

J. R. Kolanek, Manager
Environmental Services

/pgc

Enclosures

Copied: BT/CHF
Bruce Mitchell
Tom Sawicki
10/26/87

ATTACHMENT A

Calculations:

AC 05-138794

1. 1 lb. propane = 21,591 BTU/lb

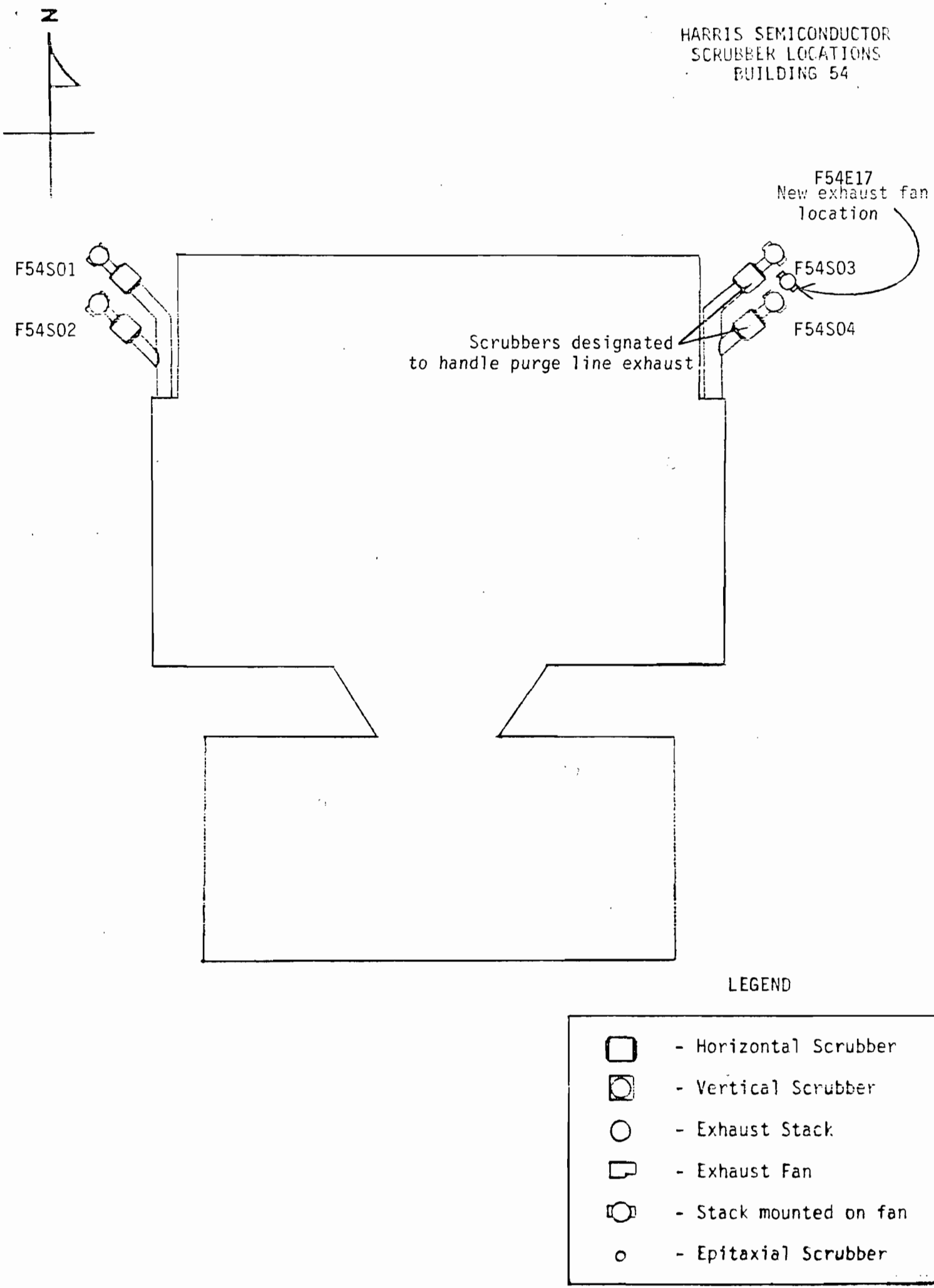
@ STP, 1 liter propane = 1.8324g propane

(1 liter = 0.2642 gallons)

(1 lb. = 453.59 grams)

$$\frac{21{,}591\ \text{BTU}}{1\ \text{lb propane}} \times \frac{1\ \text{lb propane}}{453.59\text{g propane}} \times \frac{1.8324\text{g propane}}{1\ \text{liter propane @ STP}} \times \frac{1\ \text{liter propane}}{0.264\ \text{gallon}}$$

$$= \underline{330.39\ \text{BTU/gal}}$$


N
HARRIS SEMICONDUCTOR
SCRUBBER LOCATIONS
BUILDING 54
F54E17
New exhaust fan
location
F54S01
F54S02
F54S03
F54S04
Scrubbers designated
to handle purge line exhaust
LEGEND
- Horizontal Scrubber
- Vertical Scrubber
- Exhaust Stack
- Exhaust Fan
- Stack mounted on fan
- Epitaxial Scrubber

ATTACHMENT 4